
AgriSearch NI
Driving Excellence & Innovation
25
GrassCheck NI
25th Anniversary Conference
Future-Proofing Our Pastures:
25 Years of GrassCheck and Beyond

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Driving Excellence & Innovation

GrassCheck NI
1999-2024

Welcome & Introduction

Prof. Gerry Boyle

Chair, AgriSearch

Session I
25 Years of GrassCheck

Prof. Gerry Boyle

Chair, AgriSearch

The Evolution of GrassCheck

Phase 1 1999 - 2016

Sinclair Mayne

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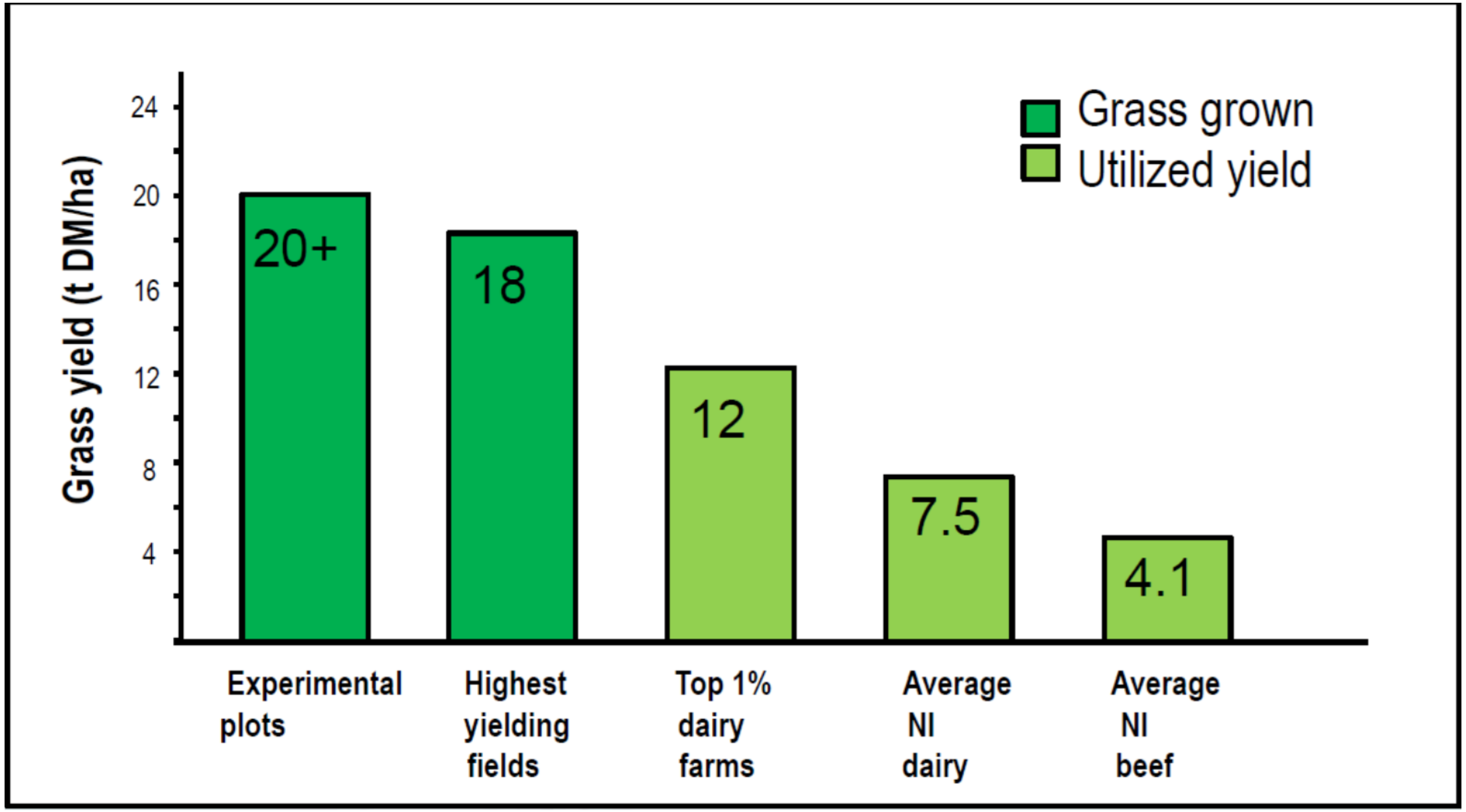
GrassCheck: Background

Efficient production and utilisation of grass is key to profitability of Northern Ireland's dairy, beef and sheep farms - Each 1000 litre increase in milk from forage is worth £120 per cow in increased margin

BUT MASSIVE RANGE IN UTILISATION ON FARM



Grass Utilisation On Farm – Major Challenges

- Variation in grass growth between and within years – and getting more variable due to climate change
- Weather challenges impacting on grass growth and particularly on utilisation

- Measuring and monitoring grass growth at farm level is crucial for decision making
- Prior to 1999, no monitoring of grass growth at a national level to assist on-farm decision making

- 1999 - Hillsborough and Greenmount teams launched a national grass measurement programme (Sam Kennedy, Ian McCluggage, Scott Laidlaw and Sinclair Mayne)

AgriSearch support and funding crucial in securing DARD funding

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GrassCheck Phase 1: Grass Growth and Quality Monitoring

- **Grass Check 1999 - 2003**
  - Provide detailed understanding of grass growth potential in Northern Ireland
  - Provide information to assist farmers in grassland management
  - Measure changes in grass quality and feeding value through the season.

- **Measurements**
  - Grass growth and quality measured weekly at Hillsborough Crossnacreevy and Greenmount.
  - Swards cut every 3 weeks - received 360 kg fertiliser N/Ha

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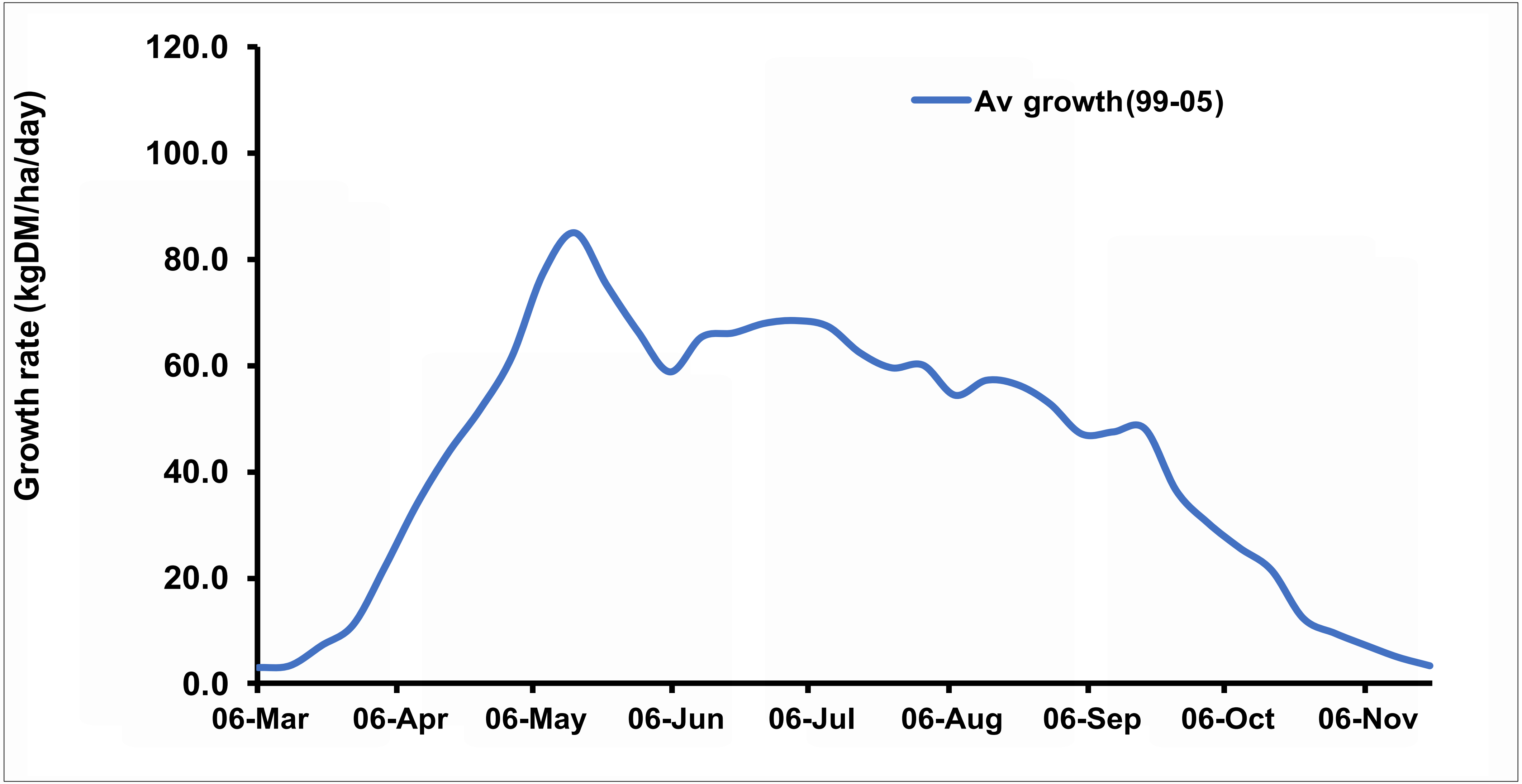
GrassCheck: Grass Growth 1999 -2005



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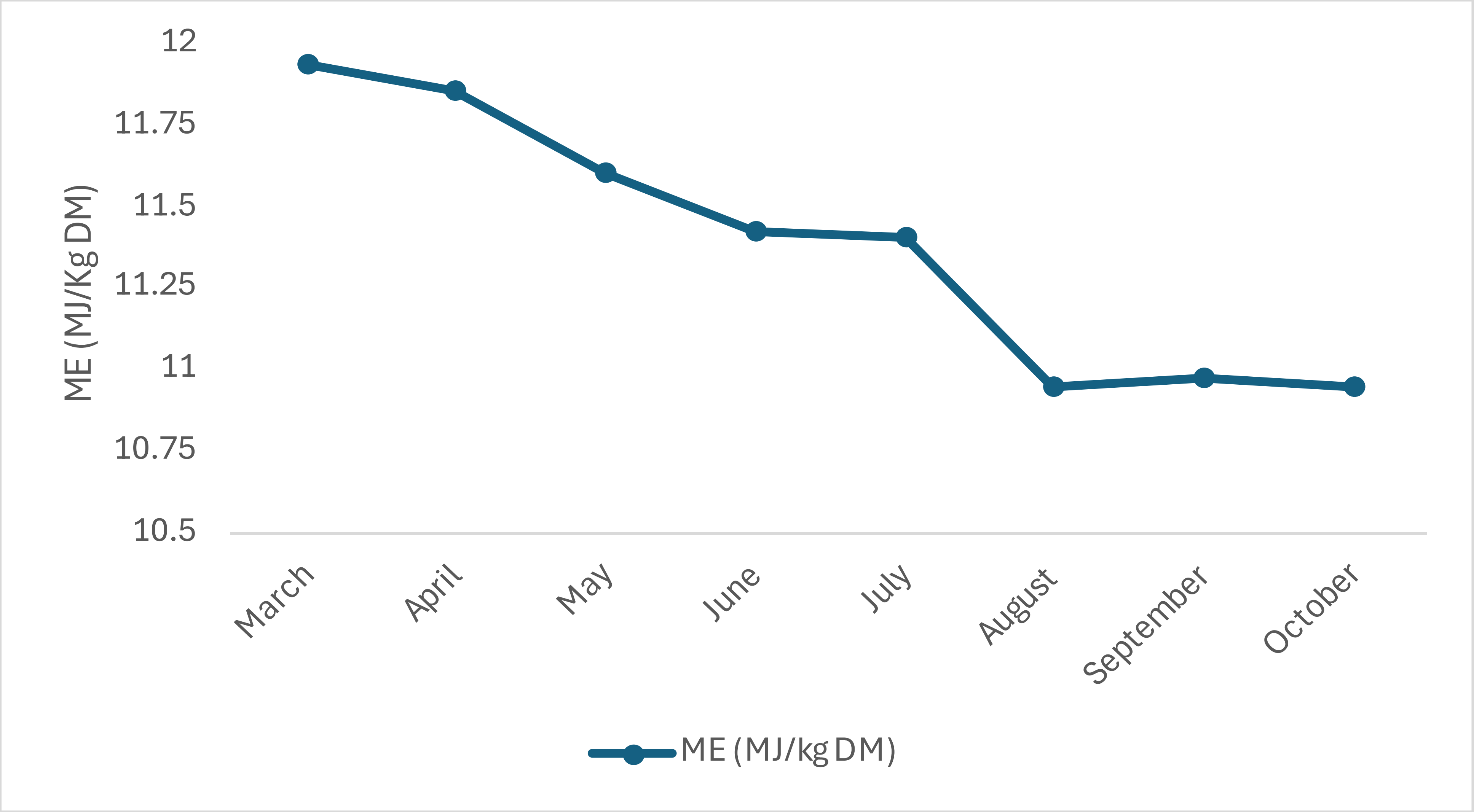
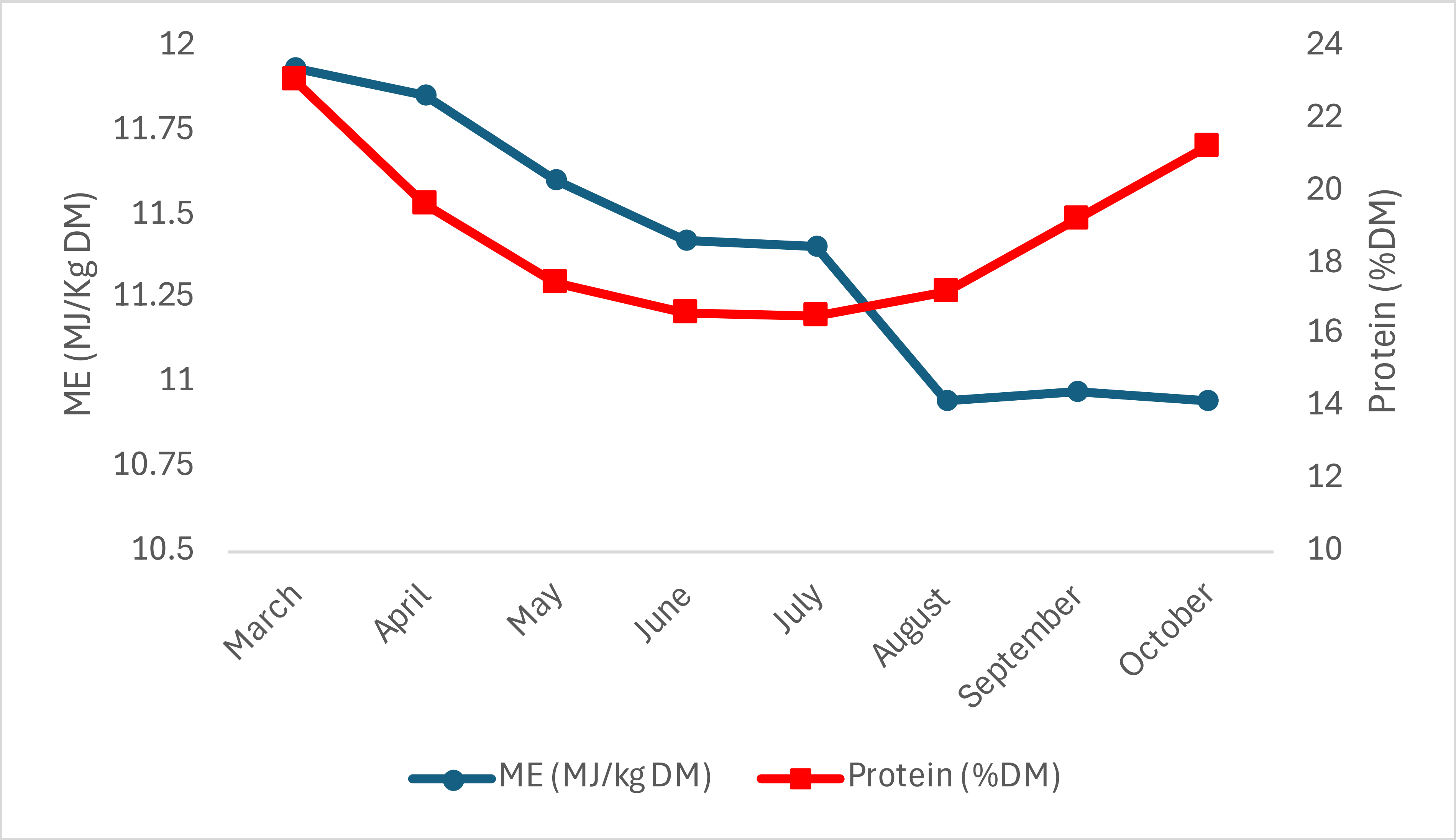
GrassCheck: Grass Quality Monitoring – ME (MJ/kg/DM)



GrassCheck: Grass Quality Monitoring - ME and CP



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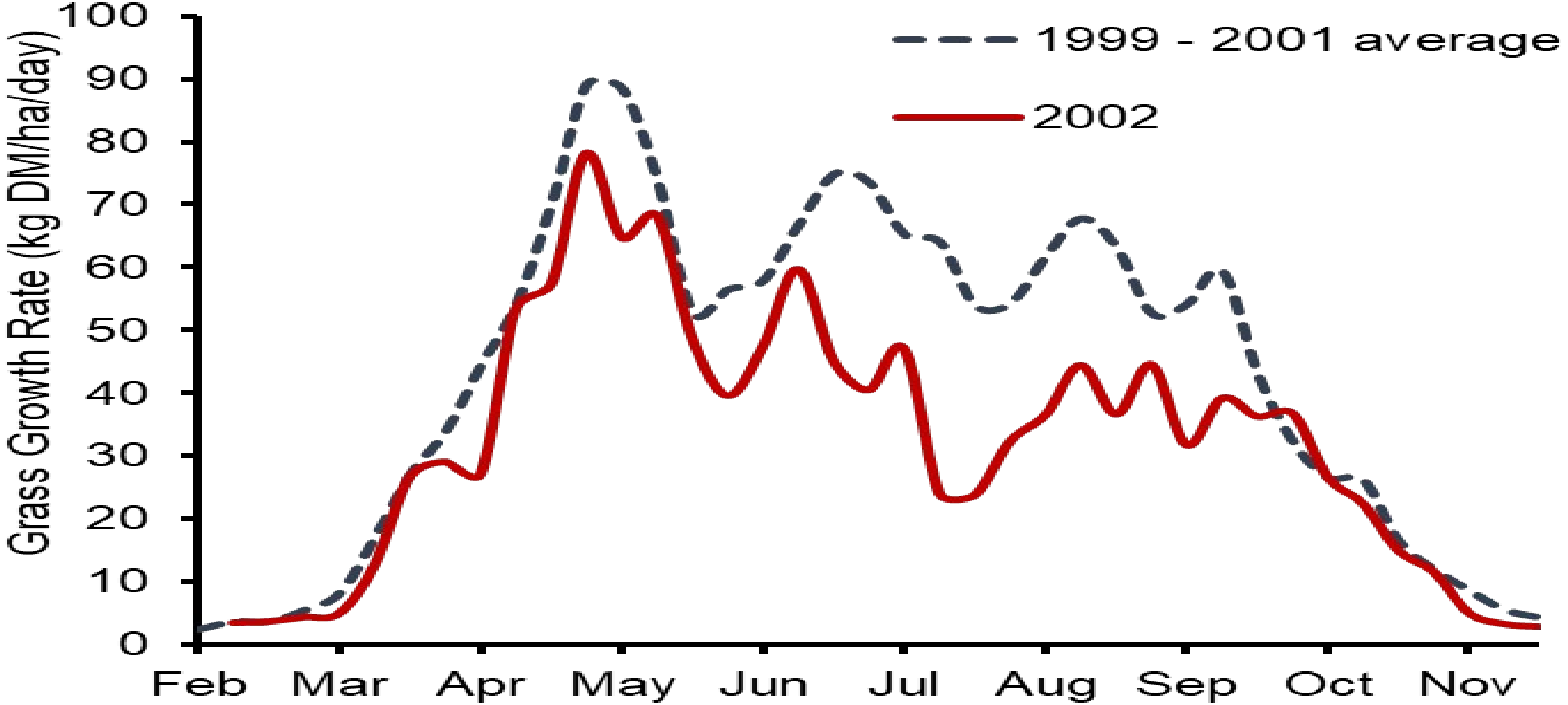
The Challenge of 2002



35% Reduction in grass growth due to weather conditions

Grass Check data crucial to securing £4.6m weather aid support

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GrassCheck 2004-2006: Predicting Future Grass Growth

- **Grass Check 2004 - 2006** Include growth prediction to assist grassland management
  - Grass growth prediction for next two weeks
  - Growth prediction based on:
    - Grass species, current growth rate, soil temp, soil fertility and moisture, predicted weather

European Journal of Agronomy

Volume 23, Issue 1, July 2005, Pages 37–56

GrazeGro: a European herbage growth model to predict pasture production in perennial ryegrass swards for decision support

P.D. Barrett[a], A.S. Laidlaw[b], C.S. Mayne[a]

- **Measurements**
  - Grass growth and quality measured weekly at Hillsborough, Crossnacreevy and Greenmount
  - Three farm sites - Fintona, Portaferry and Ballymoney
  - Swards cut every 3 weeks - received 270 kg fertiliser N/Ha

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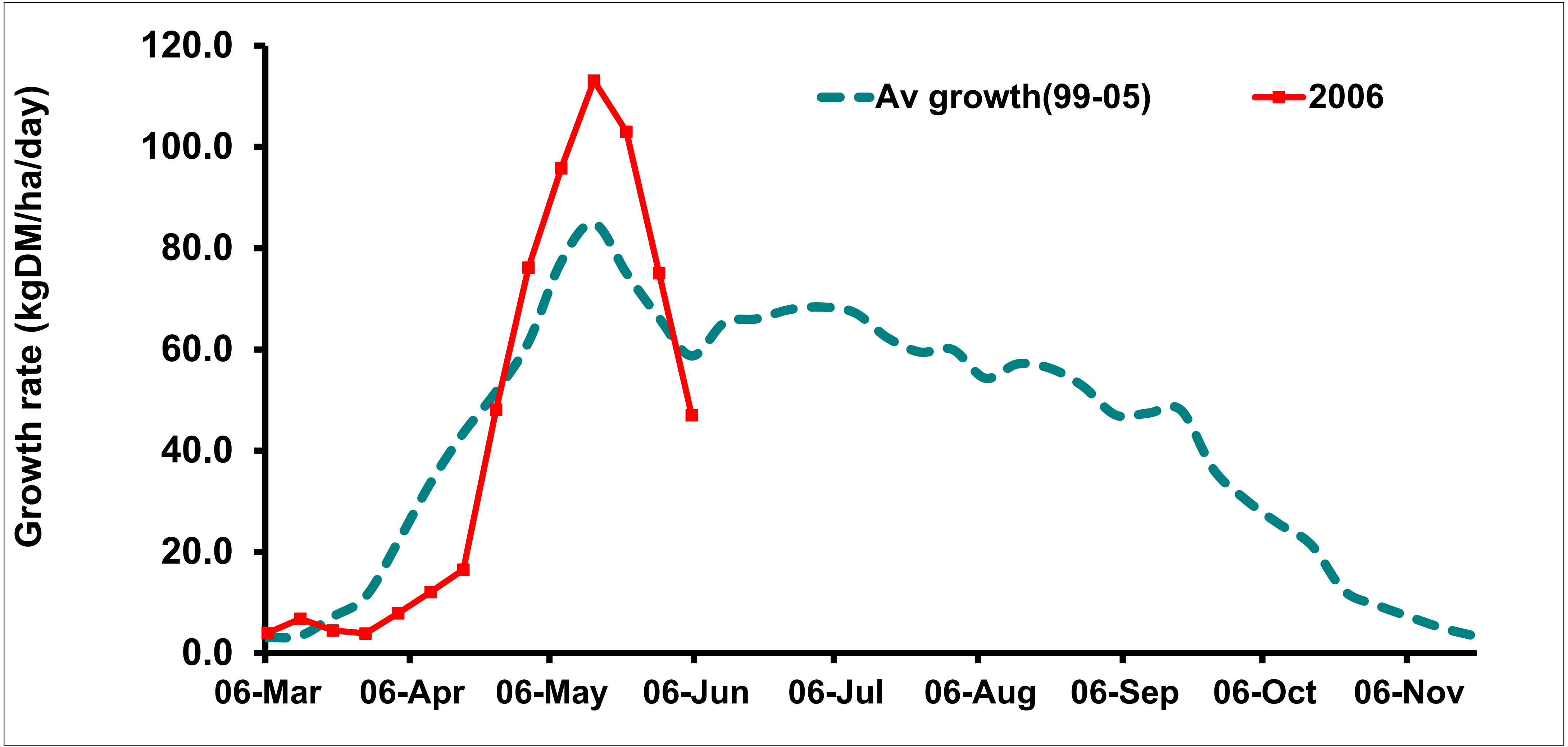
GrassCheck: Grass Growth 2006 vs Average Growth



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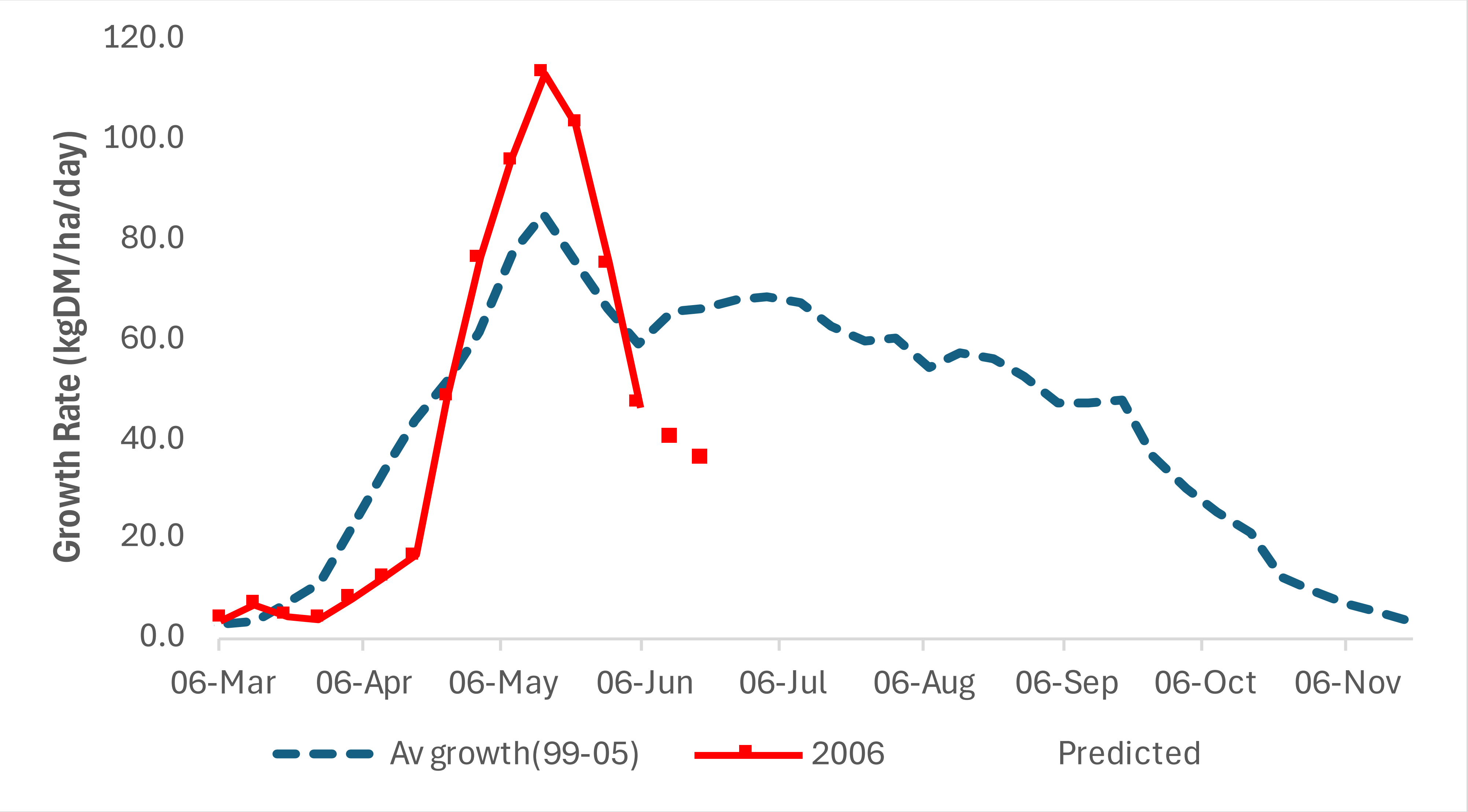
GrassCheck: Grass growth 2006 vs Average Forecast 1- Decrease



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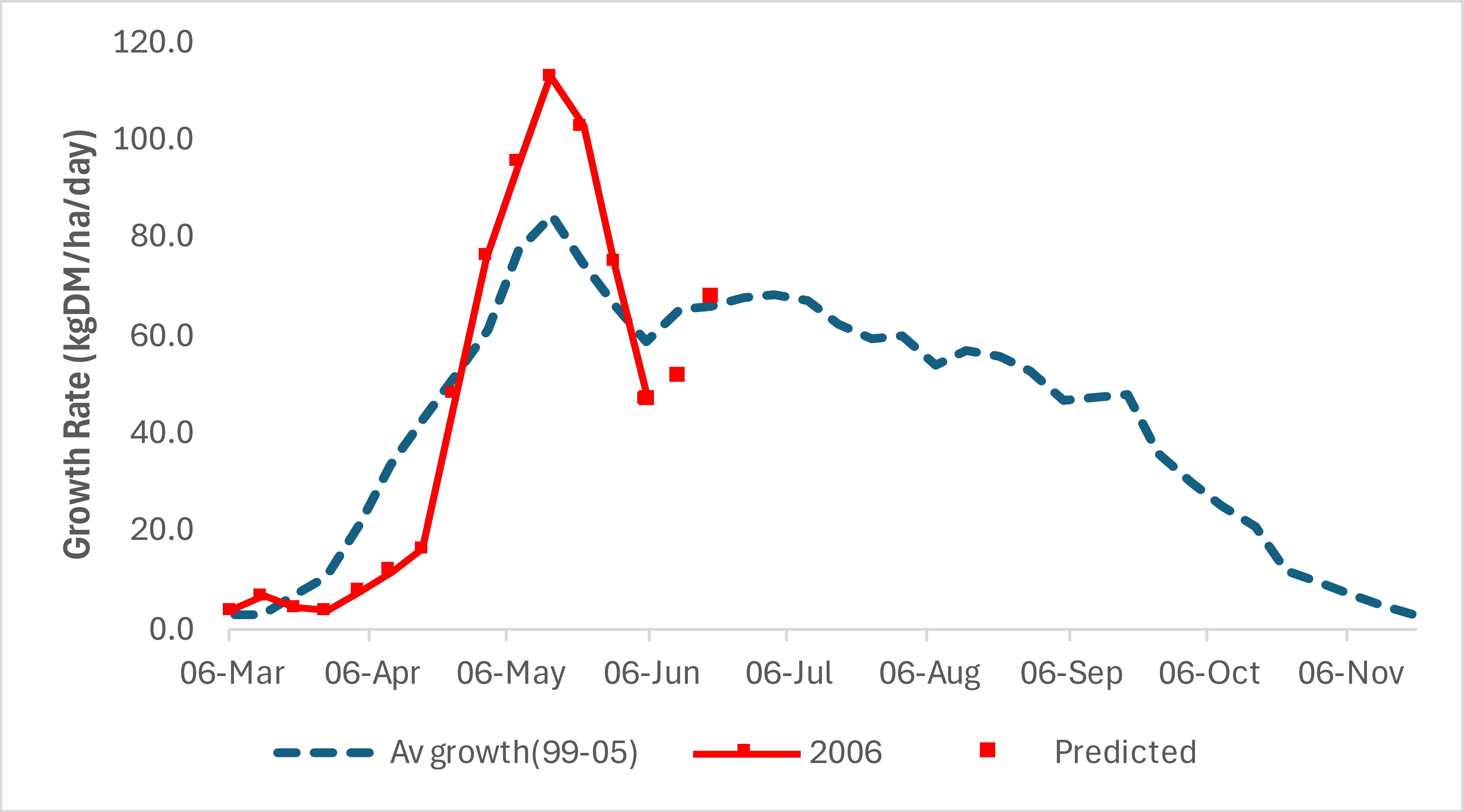
GrassCheck: Grass growth 2006 vs Average Forecast 2- Increase



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GrassCheck 2007-2012: More Farm Sites and Clover Introduced

- **Grass Check 2007 - 2012 Included additional farm sites**
  - Grass growth measured at Hillsborough, Crossnacreevy and Greenmount
  - 5 farm sites (2007 - 2010) - Fintona, Coleraine, Ballymoney, Loughgall and Portaferry
  - 4 farm sites (2011 - 2012) - Fintona, Tempo, Aghadowey and Portaferry
  - Swards cut every 3 weeks - **received 270 kg fertiliser N/Ha**
- **Clover check commenced**
  - Grassclover plots established at Hillsborough.

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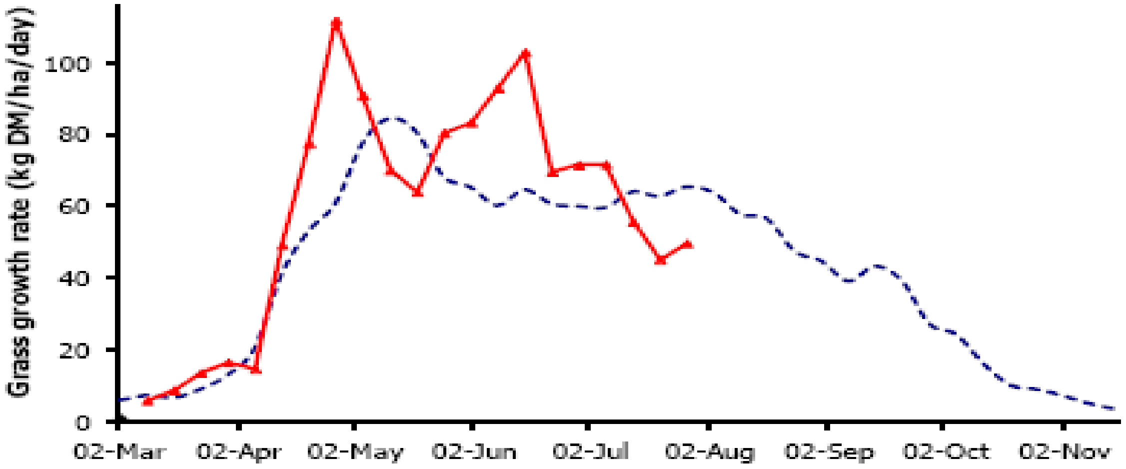
Grass Check 2007-2012 Regional Growth Rates and Growth Prediction

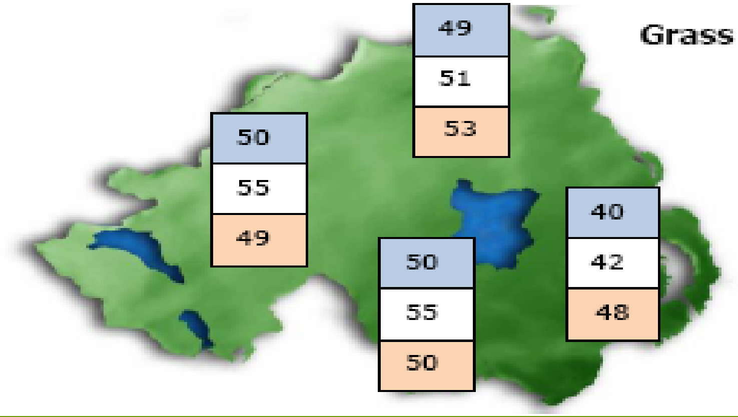


3-week Grass Growth (kg DM/ha/day)*	
Greenmount	50
Hillsborough	50
Downpatrick	36

*270 kg N/ha/year applied

Grass Quality	
Dry matter (%)	16.2
ME (MJ/kg DM)	12.0
Crude protein (%)	17.4
Sugars (% DM)	16.2

Grass growth predictions represent the average daily growth over a 21 day period



Grass Growth Predictions (kg DM/ha/day)

Current
1 week ahead
2 weeks ahead

General comment: The continuing cool and very unsettled weather is affecting growth and grazing conditions in many areas, with growth at all sites remaining below the seasonal average.

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GrassCheck 2013-2016

- **Grass Check 2013 - 2016**
  - Grass growth measured at Hillsborough and Greenmount
  - Swards cut every 3 weeks - received 270 kg fertiliser N/Ha

- **Clover check**
  - Growth of grass/clover plots measured at Hillsborough.

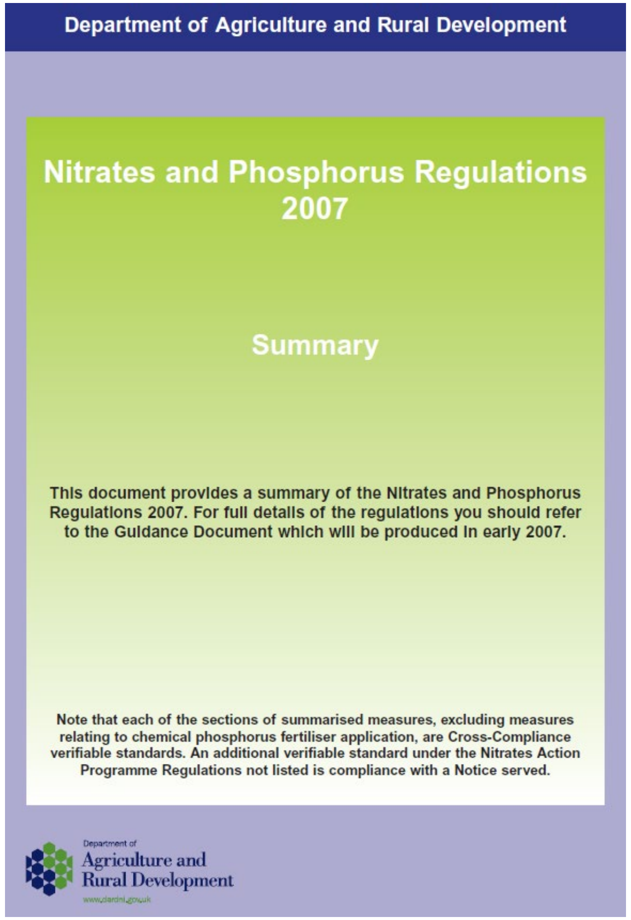
GrassCheck - Key Findings 1997-2016

Grass Growth

Long term average 11.3t DM/ha (1999-2016)

Variation Between Years Range 8.1t (2002) to 13.6t (2016)

GrassCheck - Securing Nitrates Derogation -2007


Department of Agriculture and Rural Development

Nitrates and Phosphorus Regulations 2007

Summary

This document provides a summary of the Nitrates and Phosphorus Regulations 2007. For full details of the regulations you should refer to the Guidance Document which will be produced in early 2007.

Note that each of the sections of summarised measures, excluding measures relating to chemical phosphorus fertiliser application, are Cross-Compliance verifiable standards. An additional verifiable standard under the Nitrates Action Programme Regulations not listed is compliance with a Notice served.

Department of Agriculture and Rural Development

GrassCheck Data essential in securing Nitrates Derogation in 2007

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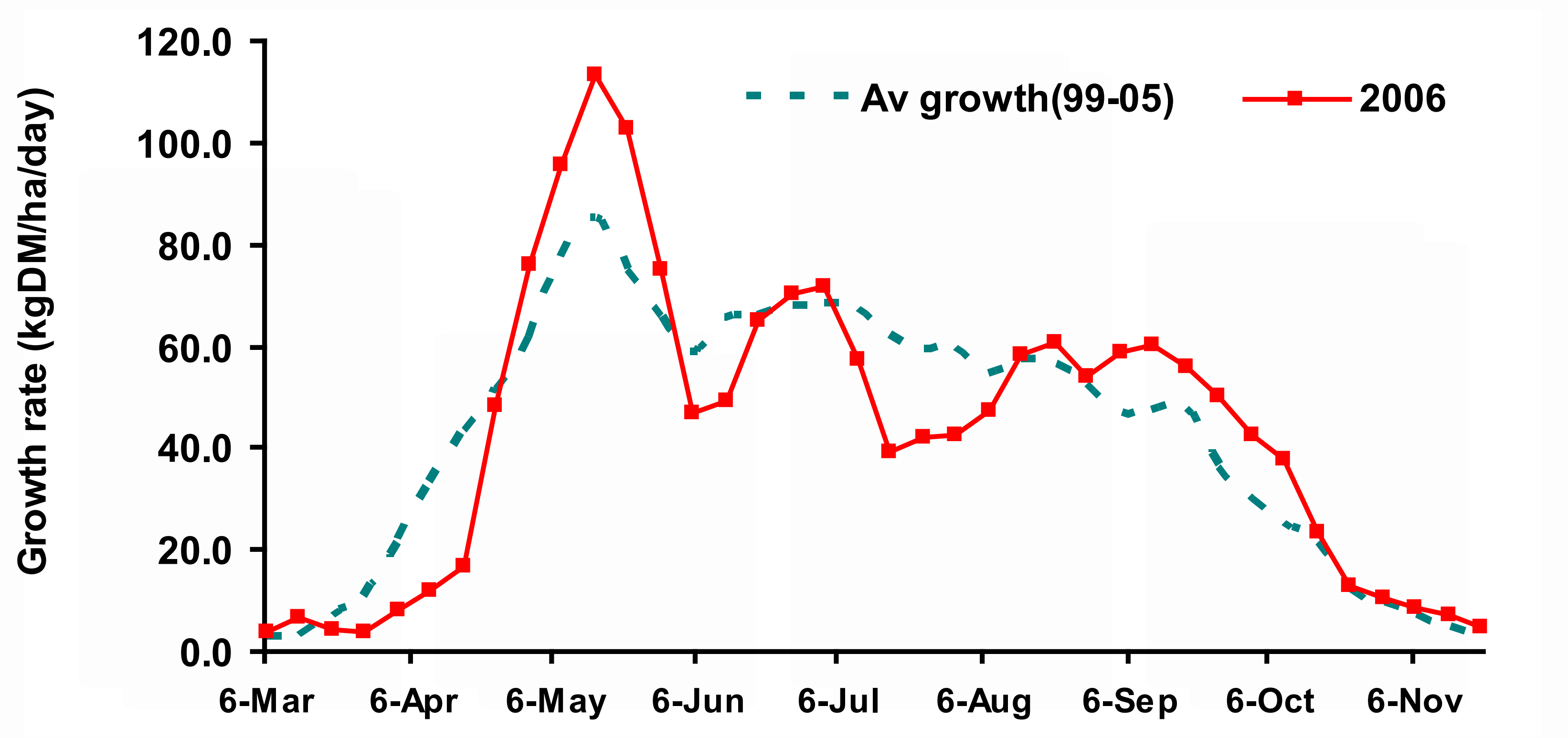
Seasonal Pattern of Grass Growth for Northern Ireland (2006)



Long growing seasons with grass growth for up to 11 months per year

Grass Check 1999 -2016 Key Outcomes

- **Key priority of Grass Check was to provide information of value to farmers:**
  - GrassCheck has provided clarity on potential of good grass swards and highlighted variation within and between years.
  - Including grass quality assessment provided feeding value of grass through the season.

- **Other benefits of Grass Check:**
  - Crucial in securing Weather Aid in 2002 - worth £4.6m
  - Essential in demonstrating grassland productivity in Northern Ireland in support Nitrates Directive Derogation in April, 2007
  - Provides historical database on grass growth and quality for last 25 years

GrassCheck - Acknowledgements

- Funders – AgriSearch and DAERA/DARD
- Farmers who provided sites for plots and assisted in project
- Staff at Greenmount, Crossnacreevy and Hillsborough
- Particular thanks to Andrew Dale, Debbie McConnell and Scott Laidlaw

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25 Years of GrassCheck
Phase II
Bringing Farmers On-Board

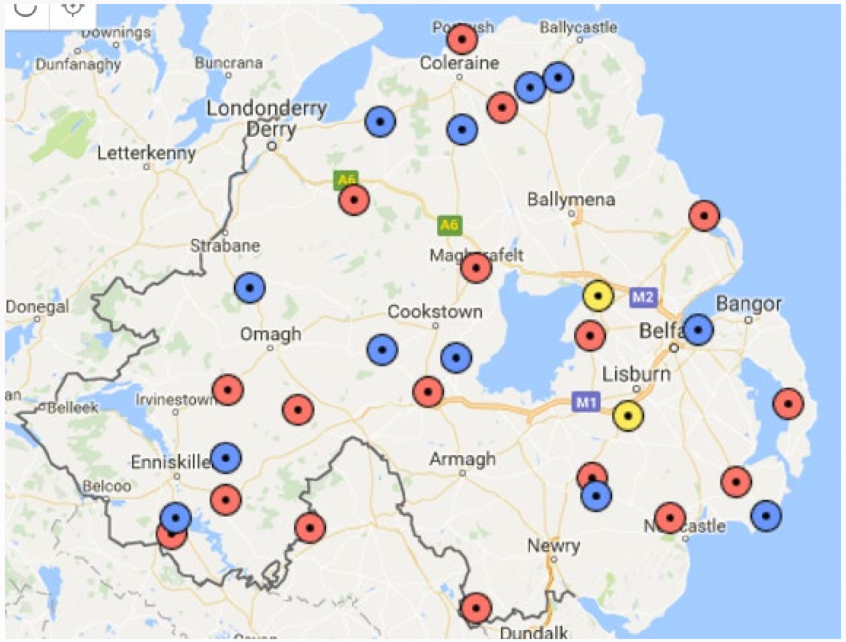
Jason Rankin

Why Change GrassCheck?

- While the GrassCheck plots and associated predictions had been world leading there was an opportunity to advance
- Plots had been reduced to two sites (both in the east) due to cost constraints
- Plots on a rigid 21-day rotation – did not reflect the situation on farm
- Growing perception that grazing was really just for County Down
- We needed to make GrassCheck relevant to every part of Northern Ireland

Getting the network established

- With initial funding from AgriSearch, DAERA and CIEL 35 farmers were recruited in January 17



- 35 dairy, beef and sheep farmers
- Range of systems, land type, growth potential and management intensity

- Monitoring of grass growth and quality
- Grass utilisation
- Farm management data

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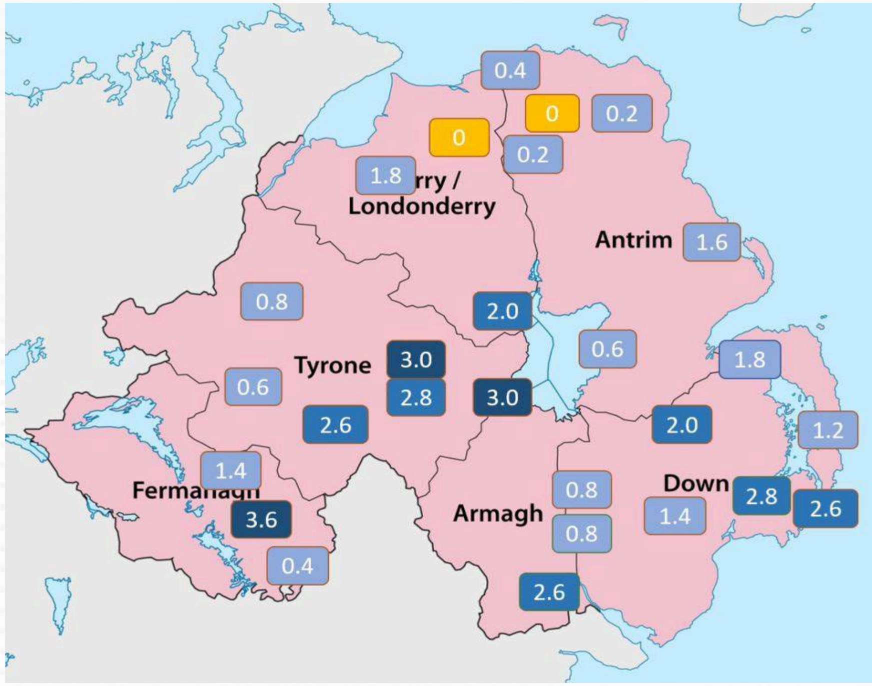
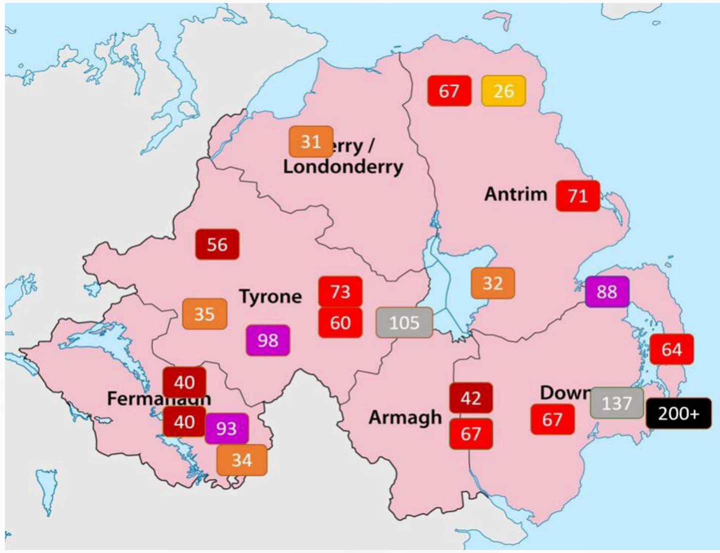
Monitoring Network

- Supported by a network of 30 weather stations
- Access to real-time weather information across Province



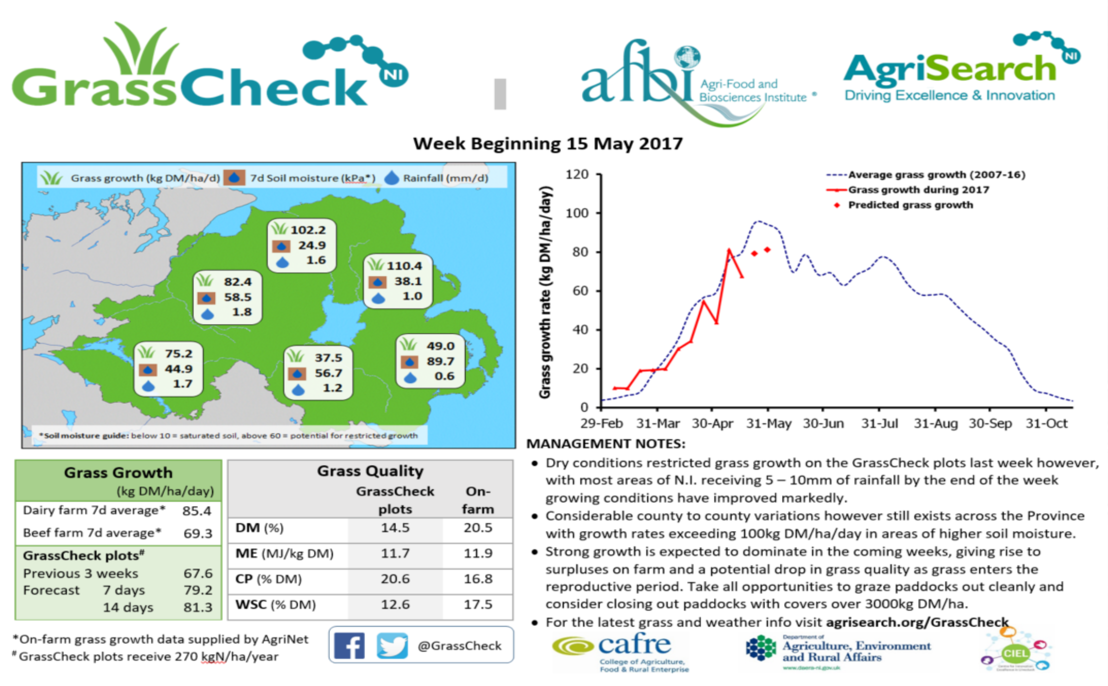
Daily rainfall monitoring

Daily soil moisture readings



Sharing the Science

- Weekly publication of GrassCheck bulletin in major farming publications
- 2017: Movement to online platforms
- GrassCheck website created
- Particular focus on social media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Week Beginning 15 May 2017

Grass Growth (kg DM/ha/day)	
Dairy farm 7d average*	85.4
Beef farm 7d average*	69.3
GrassCheck plots#	
Previous 3 weeks	67.6
Forecast 7 days	79.2
14 days	81.3

Grass Quality	GrassCheck plots	On-farm
DM (%)	14.5	20.5
ME (MJ/kg DM)	11.7	11.9
CP (% DM)	20.6	16.8
WSC (% DM)	12.6	17.5

MANAGEMENT NOTES:
- Dry conditions restricted grass growth on the GrassCheck plots last week however, with most areas of N.I. receiving 5 – 10mm of rainfall by the end of the week growing conditions have improved markedly.
- Considerable county to county variations however still exists across the Province with growth rates exceeding 100kg DM/ha/day in areas of higher soil moisture.
- Strong growth is expected to dominate in the coming weeks, giving rise to surpluses on farm and a potential drop in grass quality as grass enters the reproductive period. Take all opportunities to graze paddocks out cleanly and consider closing out paddocks with covers over 3000kg DM/ha.
- For the latest grass and weather info visit agrisearch.org/GrassCheck

*On-farm grass growth data supplied by AgriNet
#GrassCheck plots receive 270 kgN/ha/year

@GrassCheck

cafre College of Agriculture, Food & Rural Enterprise | Department of Agriculture, Environment and Rural Affairs | CIEL

facebook

- 4,508 followers
  - 2024 Reached 21,436 people
  - 766 Content interactions

X

@GrassCheck:
- 1,428 followers
- 8% Engagement Rate
- 159,727 post impressions
- 84,149 users reached

- 4,704 Podcast Downloads

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New for 2024 – weekly email bulletin

Grass Check

Featured Farmer

Ian McClelland

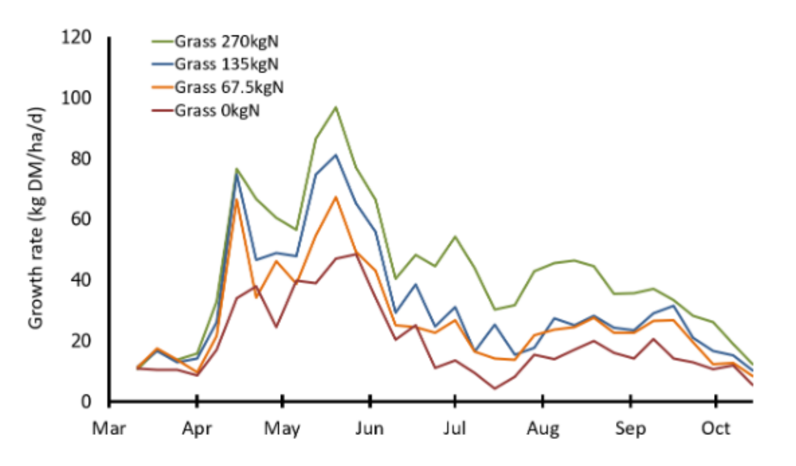
Banbridge, County Down

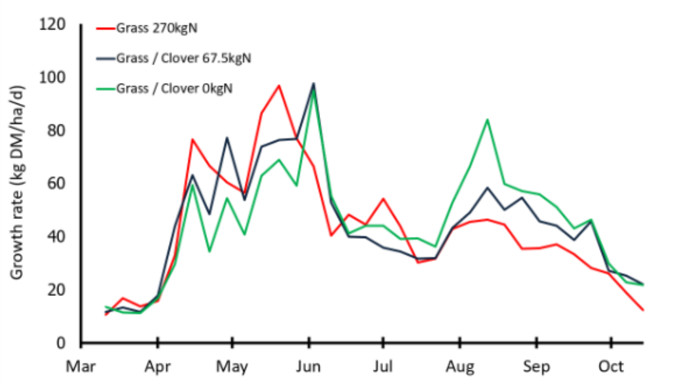
Ian McClelland farms just outside Banbridge, Co.Down. He has 100 cow dairy farm with 50 followers. Ian also has some full time and part time milkers on the farm.

Average Farm Cover: 2, 312 kgDM/ha

Current Growth Rate: 44.8 kgDM/ha/Day

What is your current grazing management strategy?	All cows are currently still out grazing and hopefully will be until the weather turns. I started calving on 14th September.
How have you approached nutrient management this year?	All slurry is out for the year.
What's your biggest challenge on farm at present?	Lack of grass and forage on farm has been and continues to be the biggest concern on farm





On-Farm Grass Growth & Quality

Beef & Sheep Farms

Grass Growth (kgDM/ha day) **24.8**

Dry Matter %	Crude Protein (% DM)	Sugars (%DM)	ME (MJ/kg DM)
15.5	21.9	10.4	11.1

Dairy Farms

Grass Growth (kgDM/ha day) **32.4**

Dry Matter %	Crude Protein (% DM)	Sugars (%DM)	ME (MJ/kg DM)
14.9	19.9	9.9	10.6

Grass Only Plots - Grass Growth and Quality

Fertiliser Rate (kgN/ha/year)	270	135	67.5
Grass Growth (kgDM/ha/day)	12.2	10.2	8.4
Grass Quality			
Dry Matter %	16.7	16.1	15.9
Crude Protein (% DM)	20.4	19.5	20.7
Sugars (% DM)	11.1	10.5	10.1
ME (MJ/kg DM)	11.0	10.8	11.0

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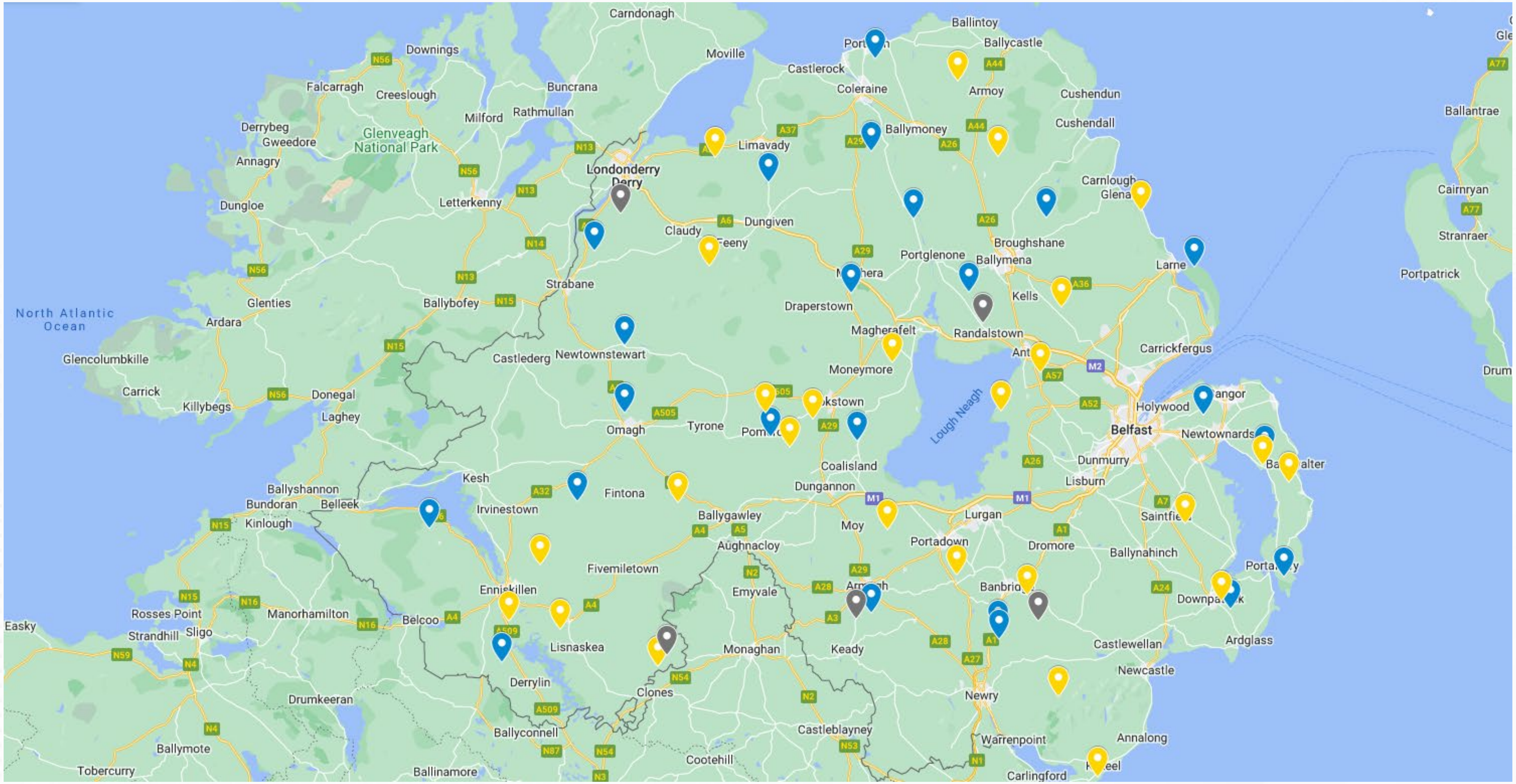
GrassCheck Today



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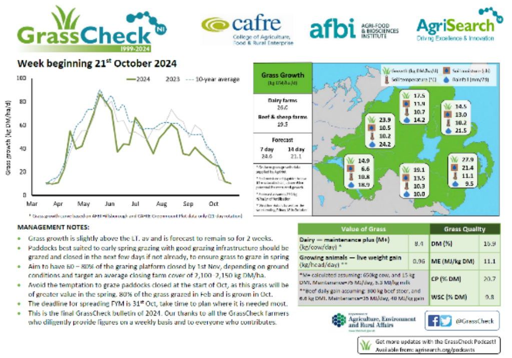
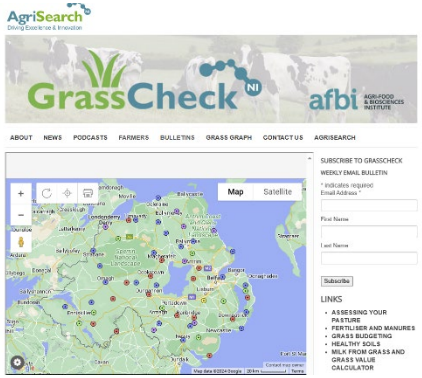
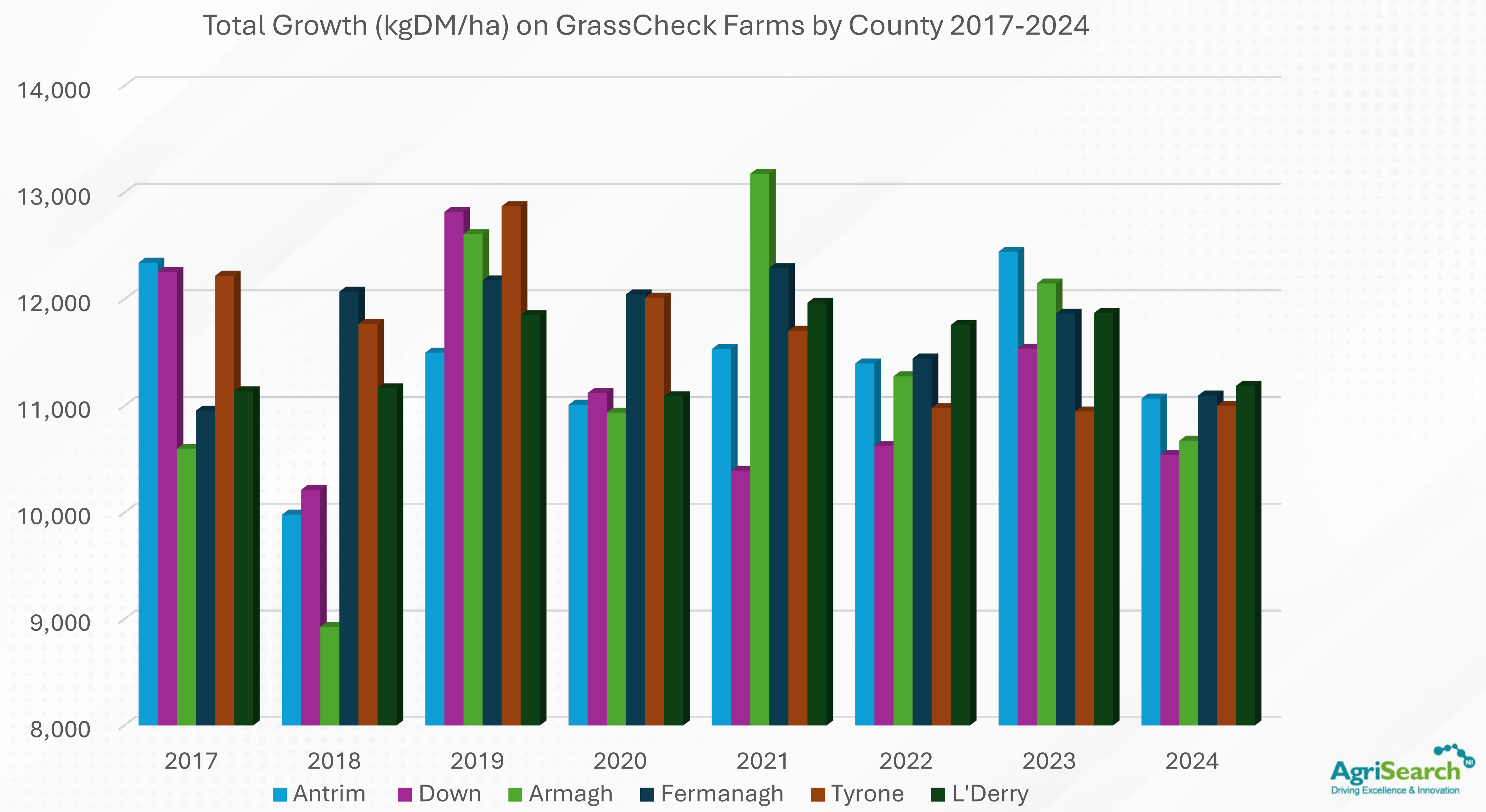
Putting it all together every week






Total Growth (kgDM/ha) on GrassCheck Farms by County 2017-2024
14,000
13,000
12,000
11,000
10,000
9,000
8,000
2017
2018
2019
2020
2021
2022
2023
2024
Antrim
Down
Armagh
Fermanagh
Tyrone
L'Derry
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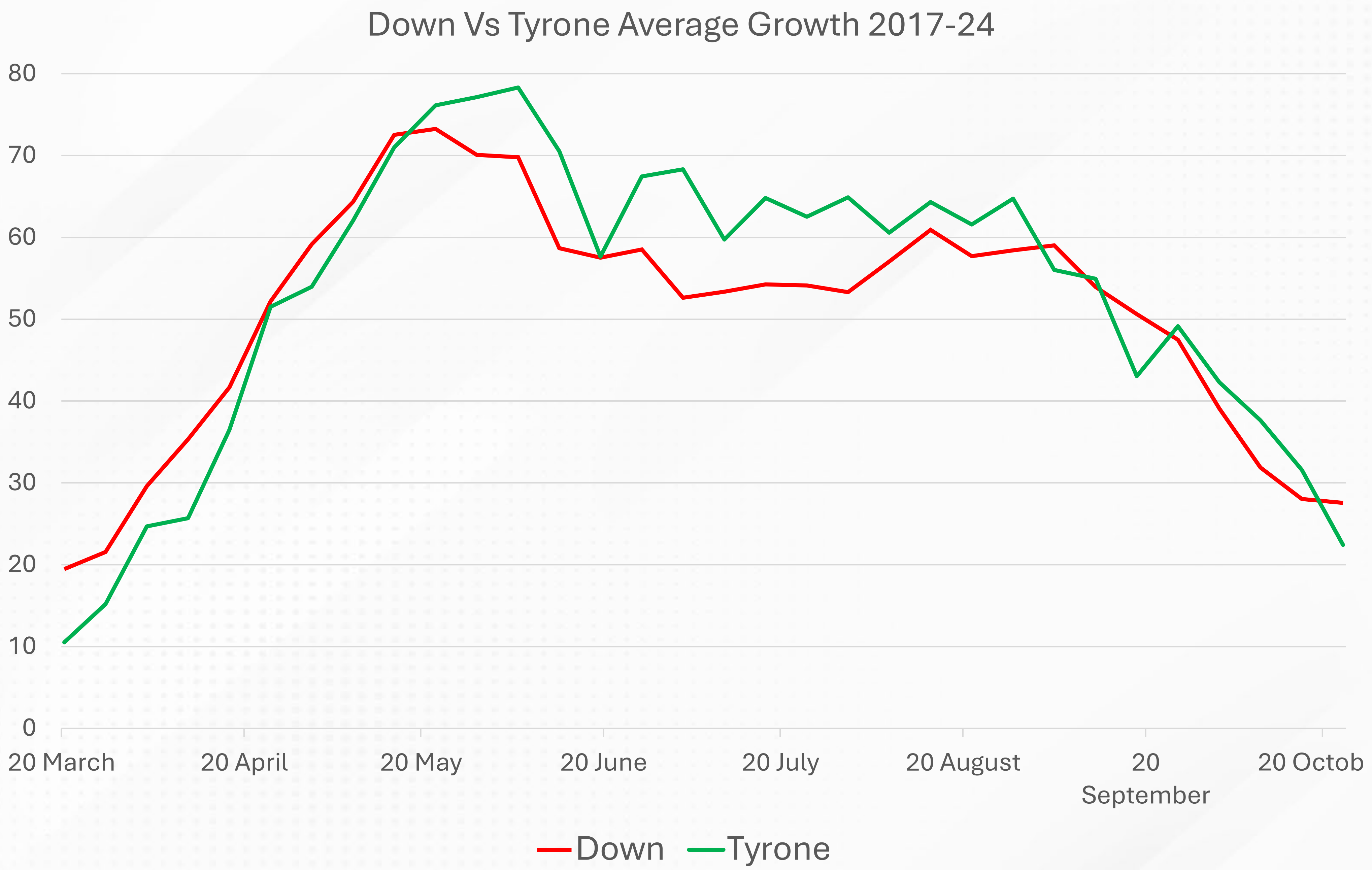

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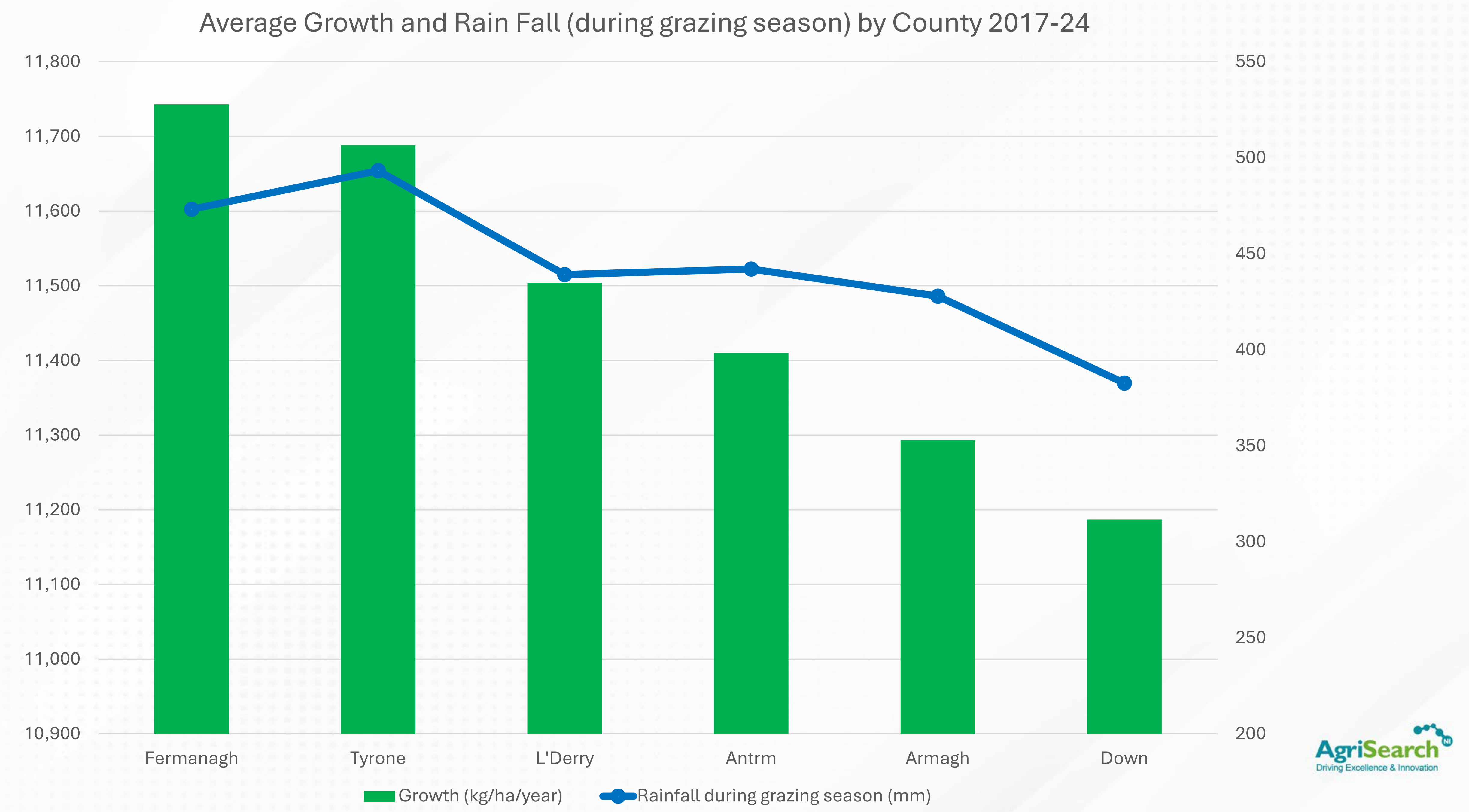

Average Growth and Rain Fall (during grazing season) by County 2017-24
11,800
11,700
11,600
11,500
11,400
11,300
11,200
11,100
11,000
10,900
550
500
450
400
350
300
250
200
Fermanagh
Tyrone
L'Derry
Antrm
Armagh
Down
Growth (kg/ha/year)
Rainfall during grazing season (mm)
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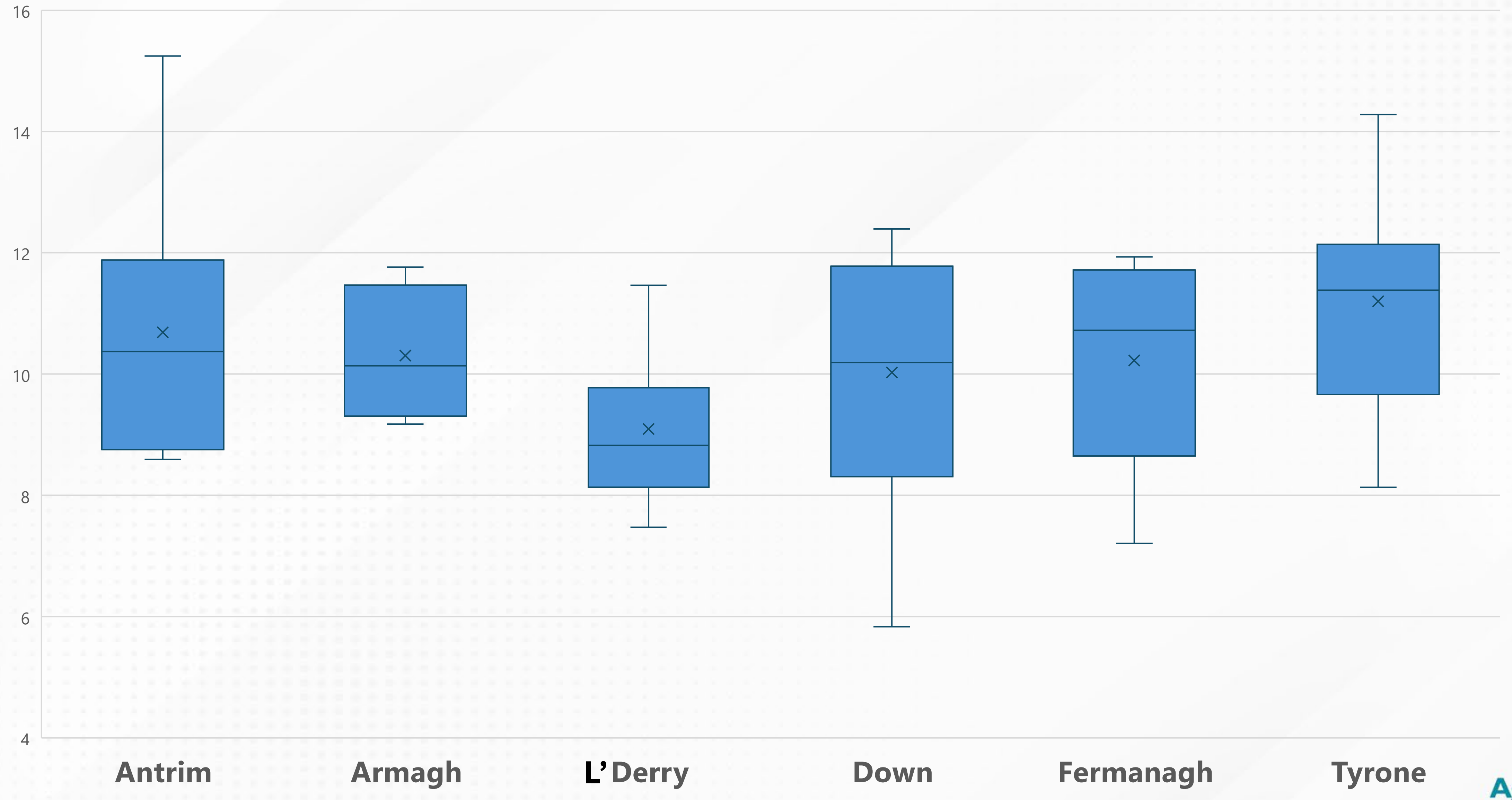
County Average Grass Growth



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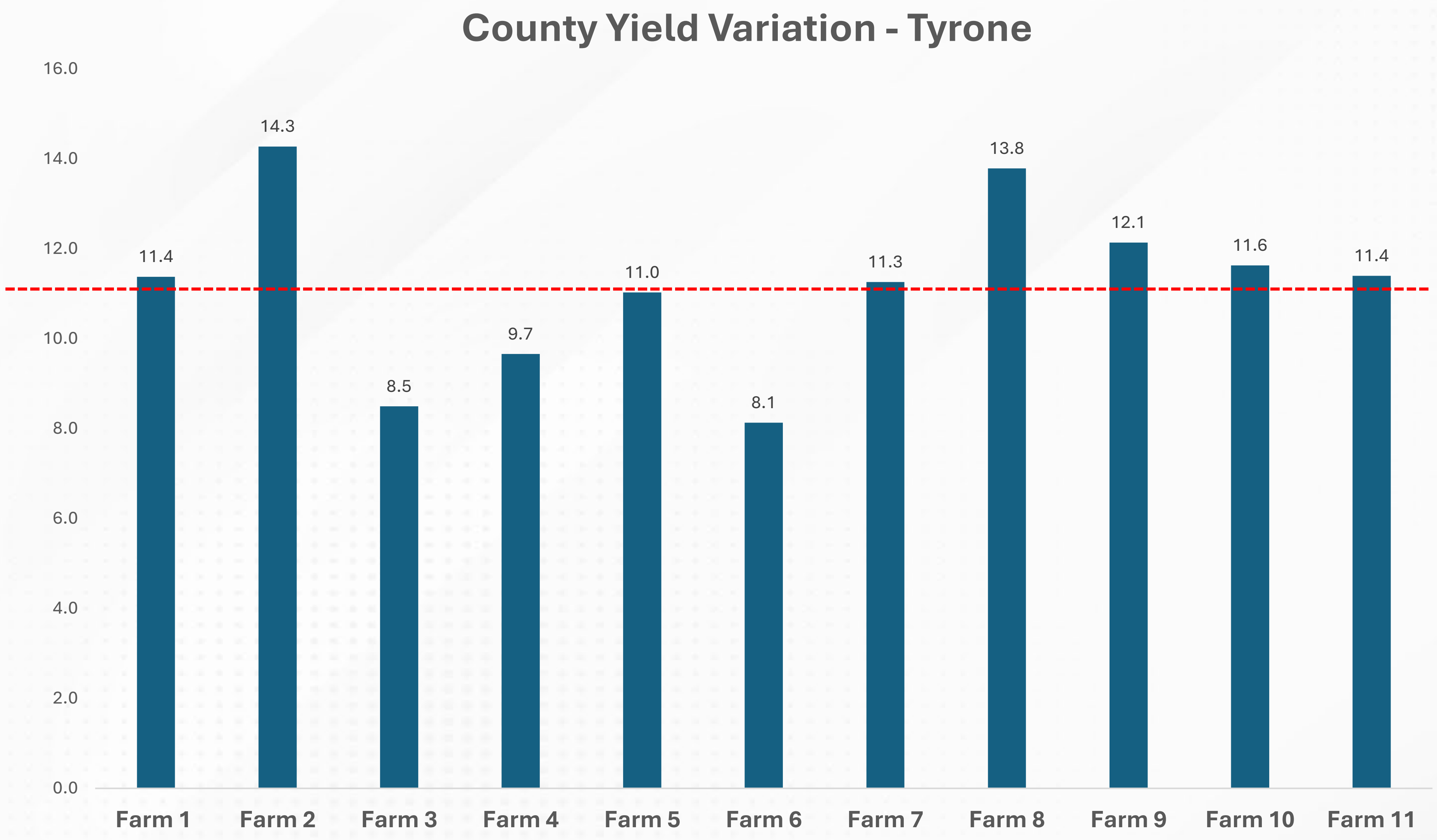

Value of Grass

Example 40ha Grazing Platform
Dairy £441/t DM
Beef £204/t DM

Top Farm

- 14.3t / Ha per Year

Bottom Farm

- 8.1t DM/year

Difference is worth

- Dairy £109,368
- Beef £50,592

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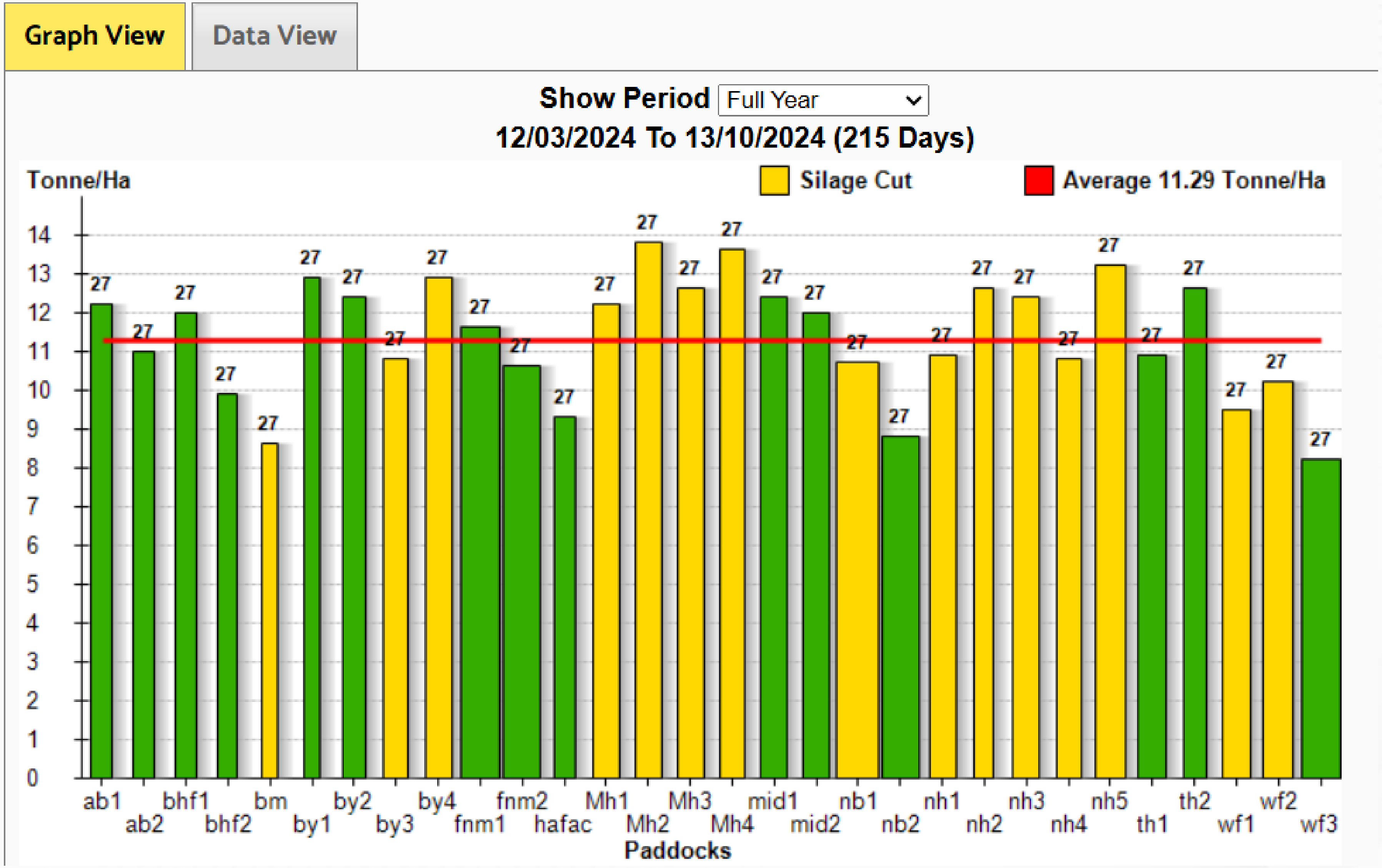
Farm Paddock Yield Variation



Value of grass

Top Paddock

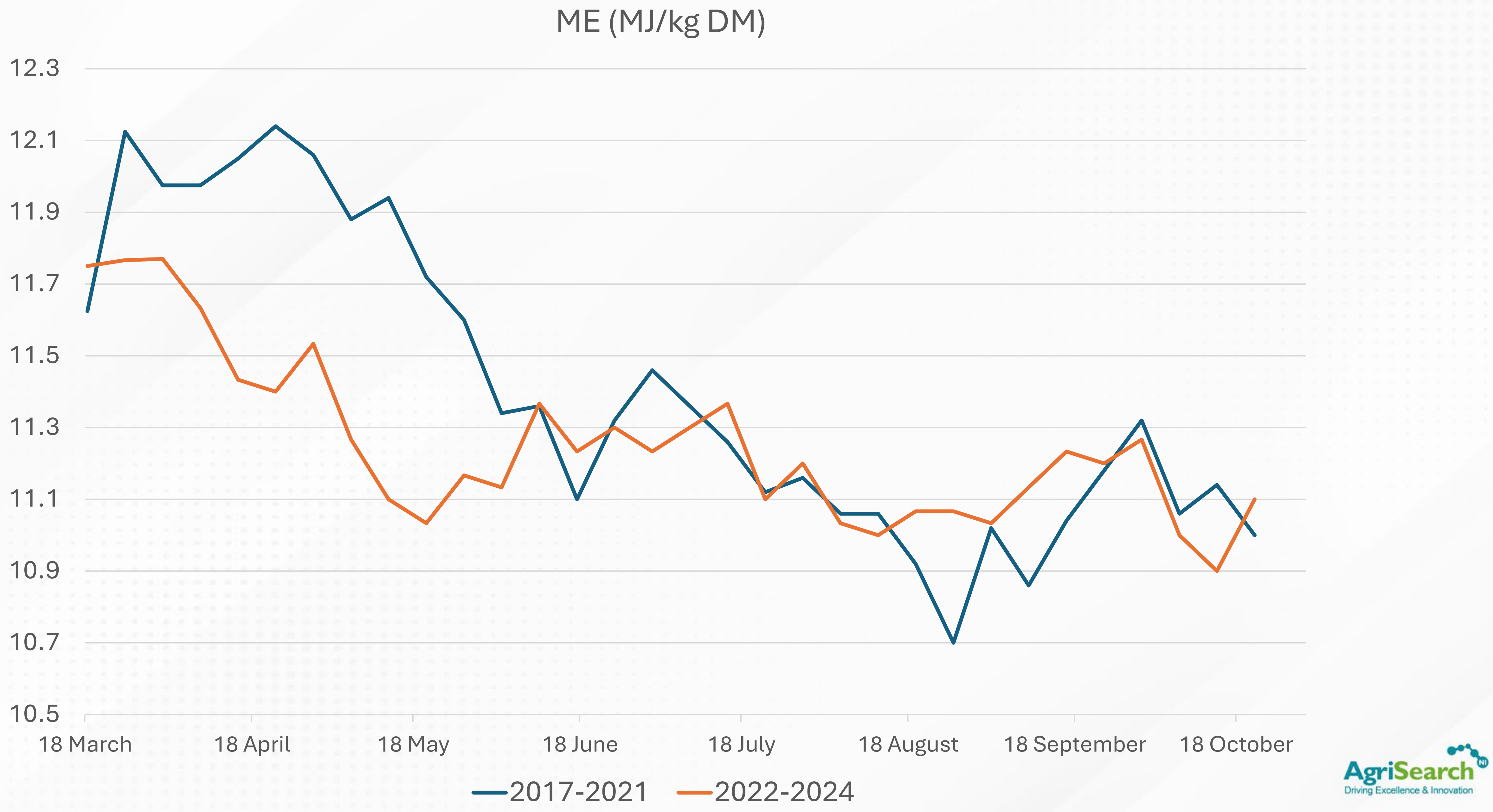
- 13.8Tt DM/ha

Bottom Paddock

- 8.2t DM/ha

Difference is worth

- Dairy £2,470/ha
- Beef £1,142/ha



ME (MJ/kg DM)
12.3
12.1
11.9
11.7
11.5
11.3
11.1
10.9
10.7
10.5
18 March
18 April
18 May
18 June
18 July
18 August
18 September
18 October
2017-2021
2022-2024
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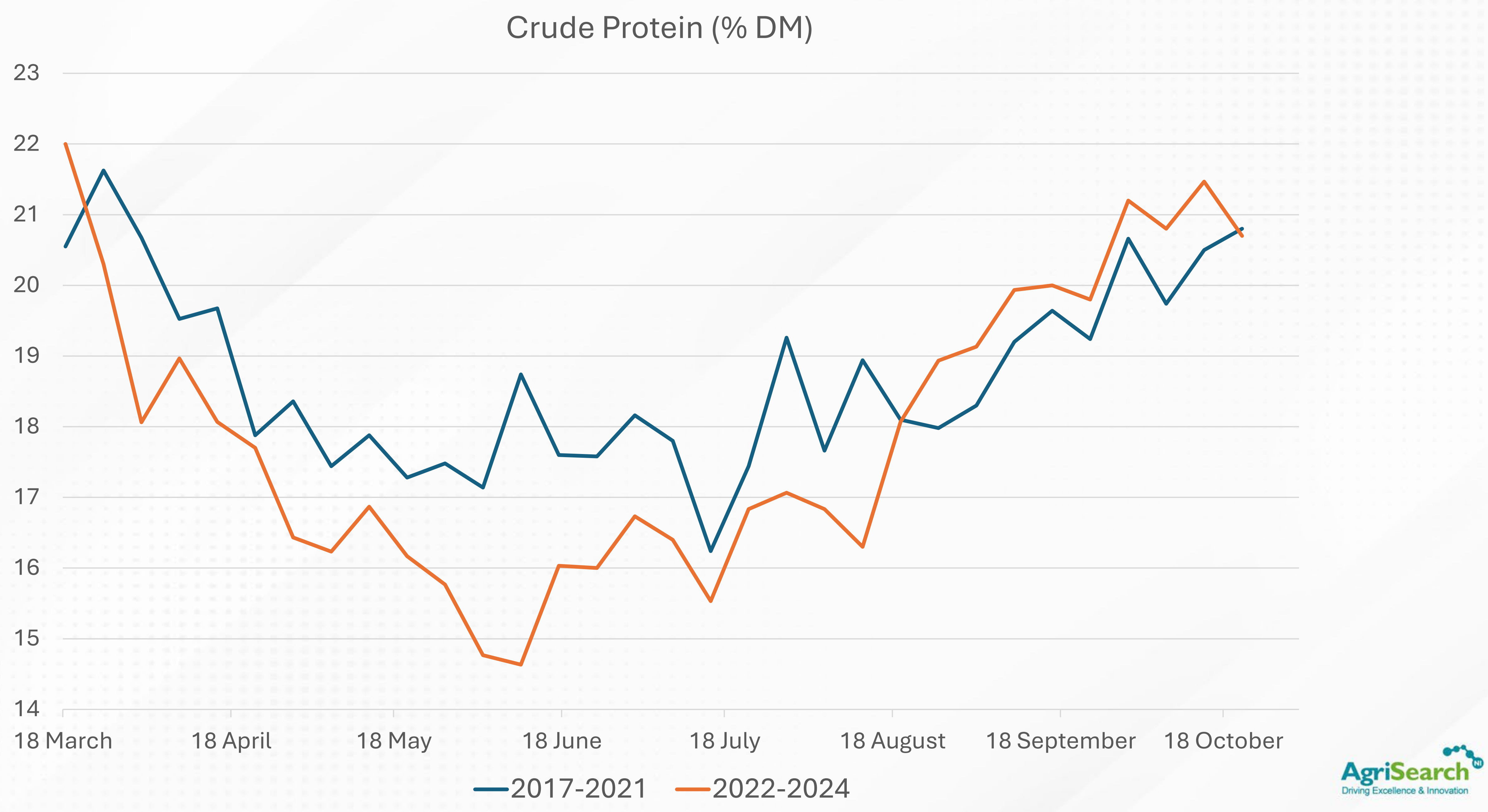

Crude Protein (% DM)
23
22
21
20
19
18
17
16
15
14
18 March
18 April
18 May
18 June
18 July
18 August
18 September
18 October
2017-2021
2022-2024
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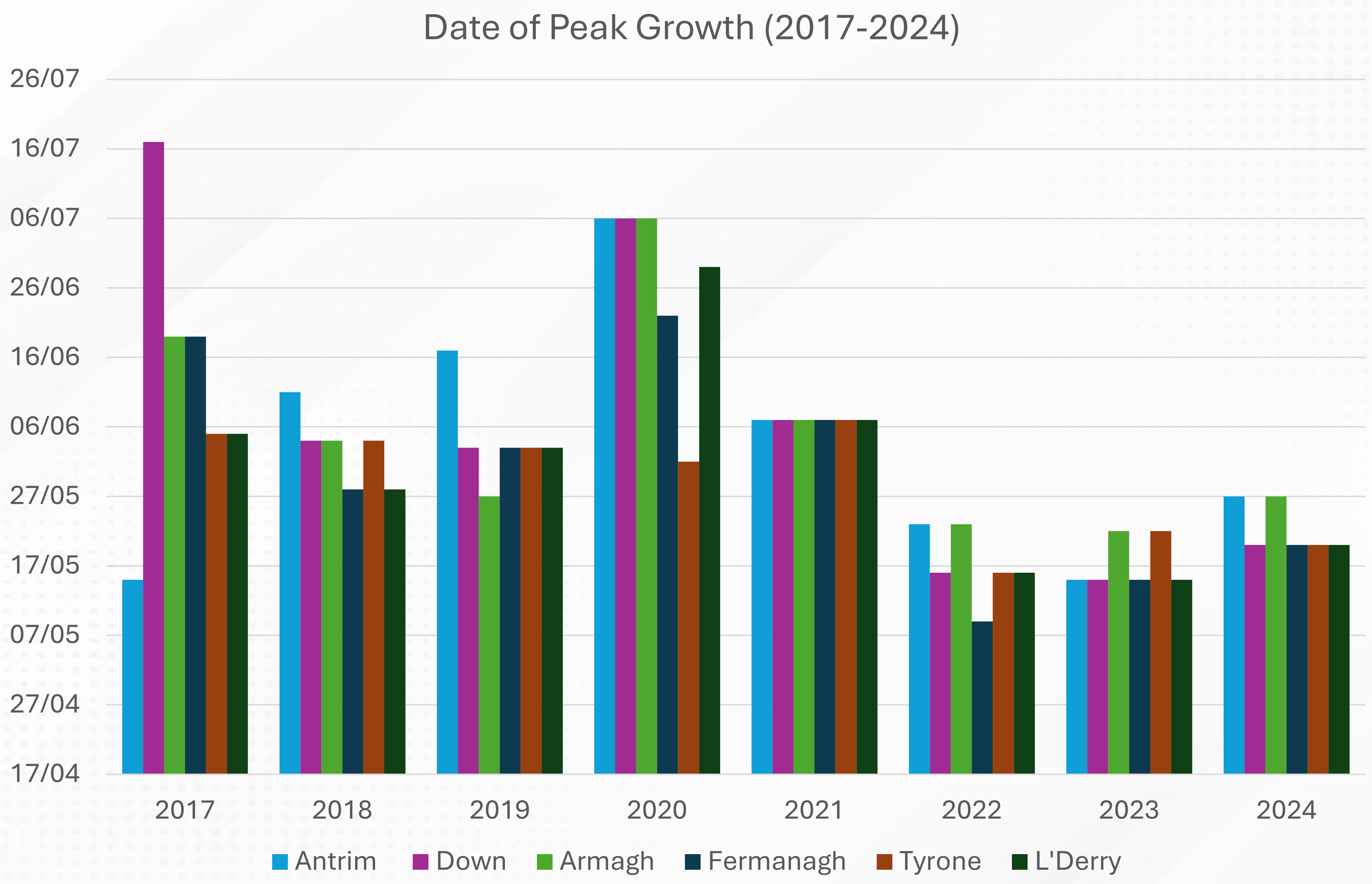
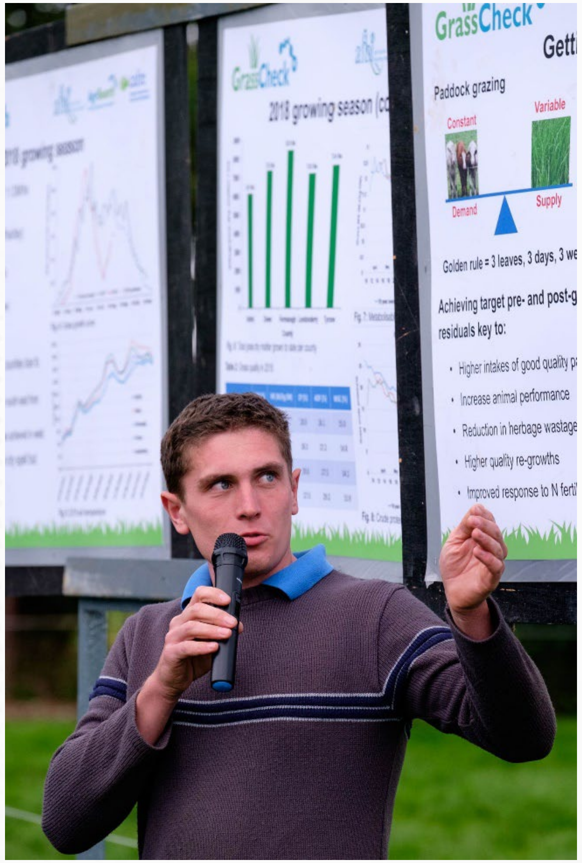
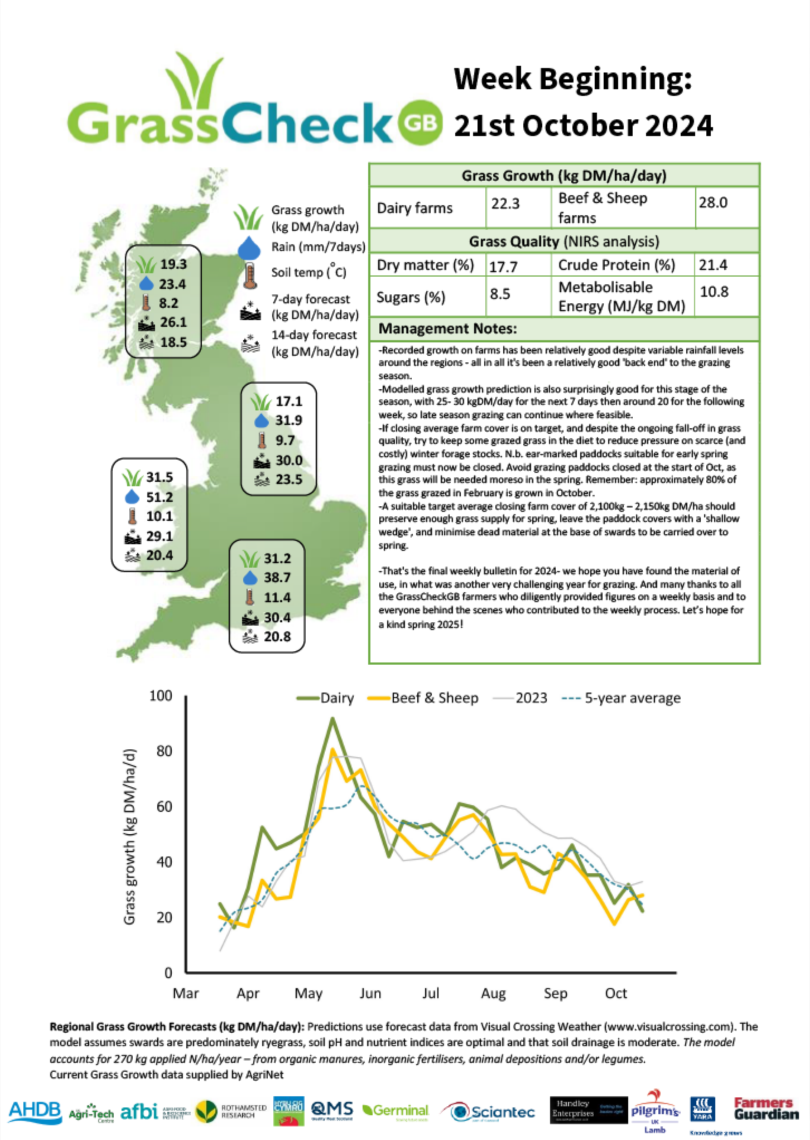

Date of Peak Growth (2017-2024)
26/07
16/07
06/07
26/06
16/06
06/06
27/05
17/05
07/05
27/04
17/04
2017
2018
2019
2020
2021
2022
2023
2024
Antrim
Down
Armagh
Fermanagh
Tyrone
L'Derry

Key Outcomes

- GrassCheck now offering much more localised grass growth and weather data.
- Social media is engaging high numbers
- GrassCheck GB
- SUPER-G





Grass Growth (kg DM/ha/day)			
Dairy farms	22.3	Beef & Sheep farms	28.0
Grass Quality (NIRS analysis)			
Dry matter (%)	17.7	Crude Protein (%)	21.4
Sugars (%)	8.5	Metabolisable Energy (MJ/kg DM)	10.8

Management Notes:

-Recorded growth on farms has been relatively good despite variable rainfall levels around the regions - all in all it's been a relatively good 'back end' to the grazing season.
-Modelled grass growth prediction is also surprisingly good for this stage of the season, with 25- 30 kgDM/day for the next 7 days then around 20 for the following week, so late season grazing can continue where feasible.
-If closing average farm cover is on target, and despite the ongoing fall-off in grass quality, try to keep some grazed grass in the diet to reduce pressure on scarce (and costly) winter forage stocks. N.b. ear-marked paddocks suitable for early spring grazing must now be closed. Avoid grazing paddocks closed at the start of Oct, as this grass will be needed moreso in the spring. Remember: approximately 80% of the grass grazed in February is grown in October.
-A suitable target average closing farm cover of 2,100kg – 2,150kg DM/ha should preserve enough grass supply for spring, leave the paddock covers with a 'shallow wedge', and minimise dead material at the base of swards to be carried over to spring.

-That's the final weekly bulletin for 2024- we hope you have found the material of use, in what was another very challenging year for grazing. And many thanks to all the GrassCheckGB farmers who diligently provided figures on a weekly basis and to everyone behind the scenes who contributed to the weekly process. Let's hope for a kind spring 2025!

Regional Grass Growth Forecasts (kg DM/ha/day): Predictions use forecast data from Visual Crossing Weather (www.visualcrossing.com). The model assumes swards are predominately ryegrass, soil pH and nutrient indices are optimal and that soil drainage is moderate. *The model accounts for 270 kg applied N/ha/year – from organic manures, inorganic fertilisers, animal depositions and/or legumes.*
Current Grass Growth data supplied by AgriNet

SUPER-G
SUSTAINABLE PERMANENT GRASSLAND

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Where next?

- GrassCheck has a wealth of data which can be explored
  - PhD Student has recently been appointed to mine the data
- Giving more tailored advice
- County specific forecasts
- More work on monitoring grass clover swards on-farm
- Linking GrassCheck data to a long-term soil carbon observatory
- Where is our next grassland agronomist coming from?
- A Grass 10 for Northern Ireland? (A co-ordinated campaign to enable farmers to optimise their grassland management)
- A medium to long-term solution for funding

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Session II
Looking to the Future

Ian McCluggage
Vice-Chair, AgriSearch

AGRI-FOOD
& BIOSCIENCES
INSTITUTE

Leading | Protecting | Enhancing

Modelling the future growth in Northern Ireland

GrassCheck 25th Anniversary Conference (12 Nov 2024)

Dr Taro Takahashi FRSA

Head of Precision Grazing Systems
Agri-Food & Biosciences Institute

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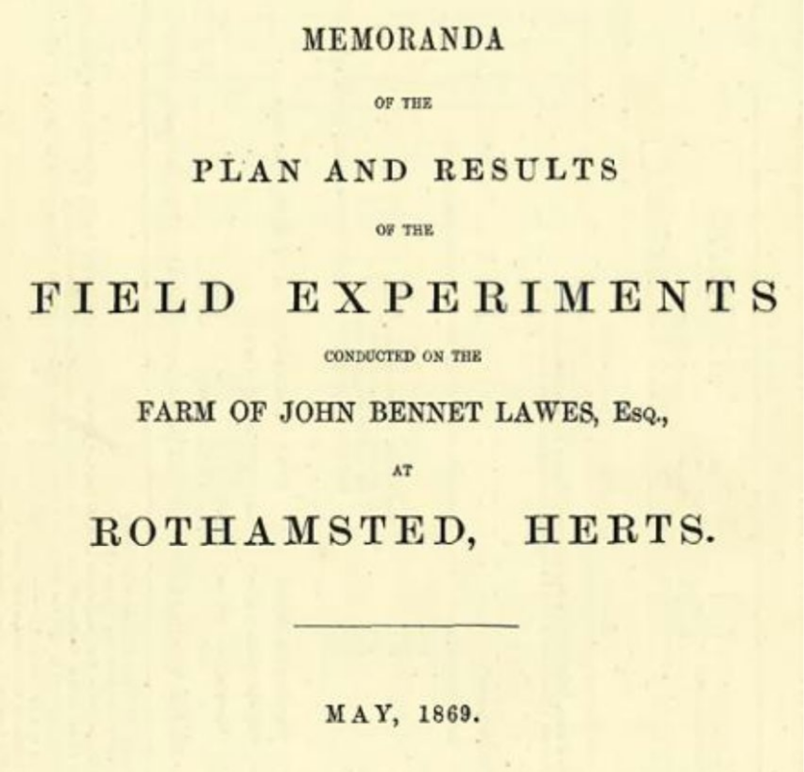
Long-term data do matter — Broadbalk experiment (1843–)



MEMORANDA

OF THE

PLAN AND RESULTS

OF THE

FIELD EXPERIMENTS

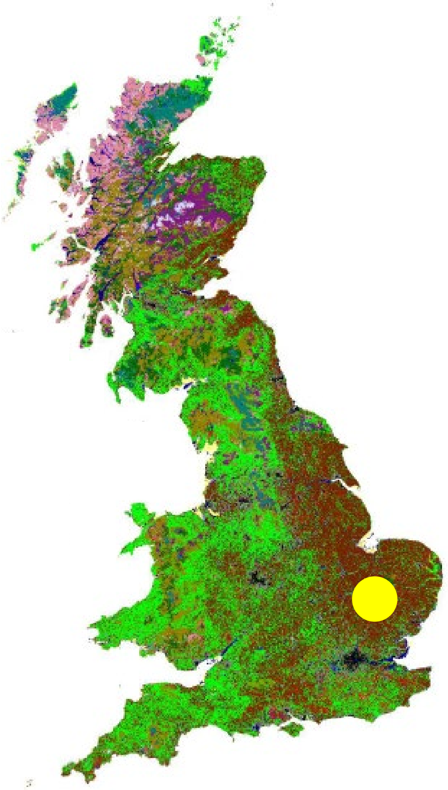
CONDUCTED ON THE

FARM OF JOHN BENNET LAWES, Esq.,

AT

ROTHAMSTED, HERTS.

MAY, 1869.



- Oldest scientific experiment still running according to the Guinness World Records
- Has maintained same fertilisation treatments for 180 years

Long-term data do matter — Broadbalk experiment (1843–)

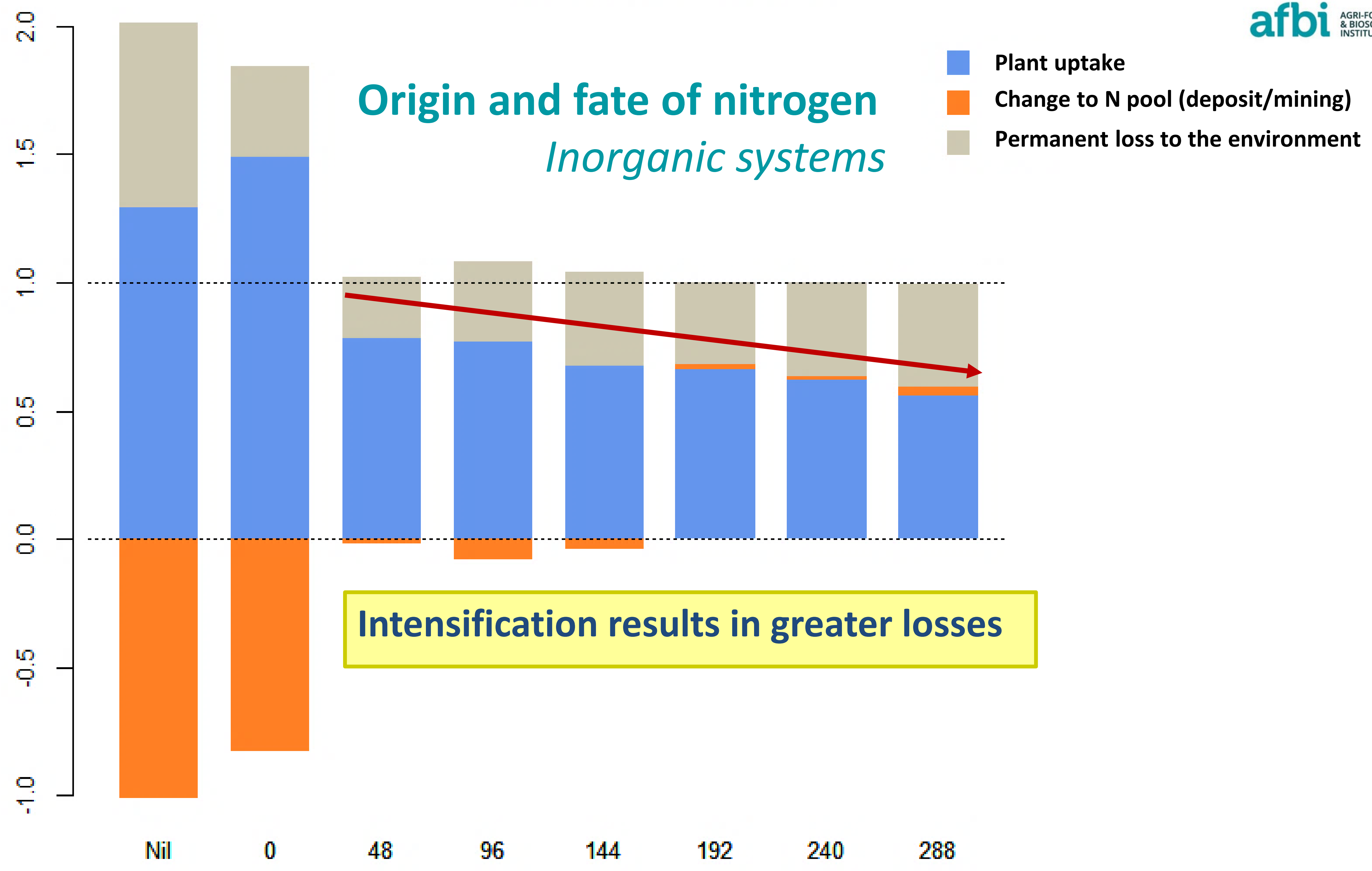
- Oldest scientific experiment still running according to the Guinness World Records
- Has maintained same fertilisation treatments for 180 years

Long-term data do matter — Broadbalk experiment (1843–)

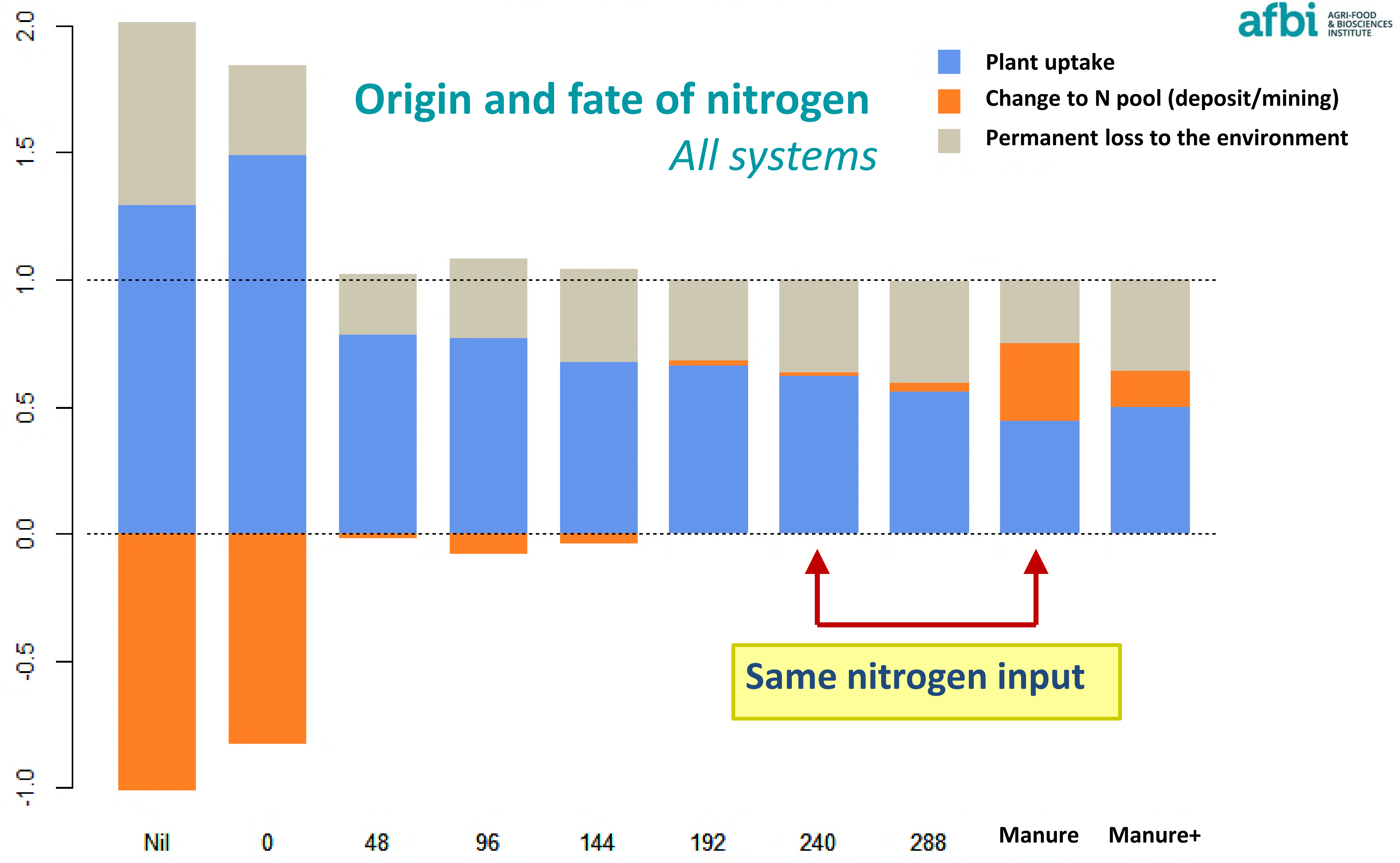
- ❖ (1) no fertilisation, (2) inorganic N only, (3) manure only, (4) manure+
- ❖ Fate of nitrogen analysis — plant uptake, change in pool (deposit/mining) or permanently lost to environment (sum to 1)

Origin and fate of nitrogen

Inorganic systems



Intensification results in greater losses



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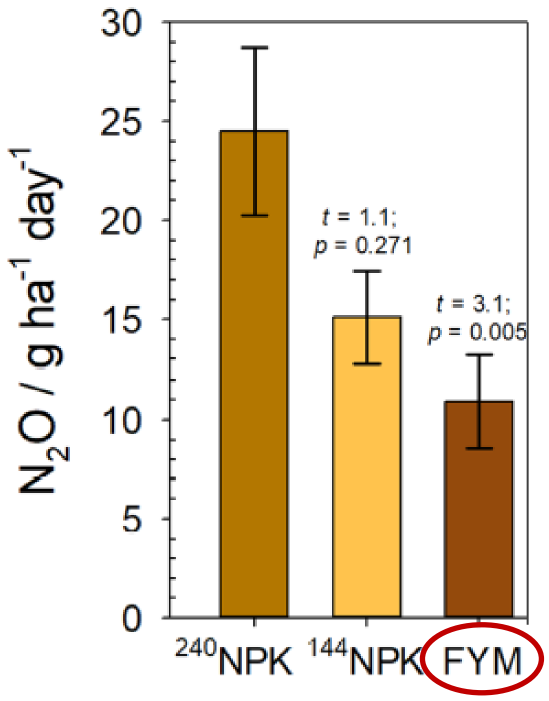
Origin and fate of nitrogen
All systems
Plant uptake
Change to N pool (deposit/mining)
Permanent loss to the environment
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
Nil
0
48
96
144
192
240
288
Manure
Manure+
Same nitrogen input

Long-term data do matter — Broadbalk experiment (1843–)



- Organic plots: more fertile soils, less N_2O emissions (per ha)
- Challenges the argument for uninformed livestock reduction

Neal *et al*. (2022) *Nature Food*

GrassCheck — from field observations to modelling

Separating climate effects from weather effects

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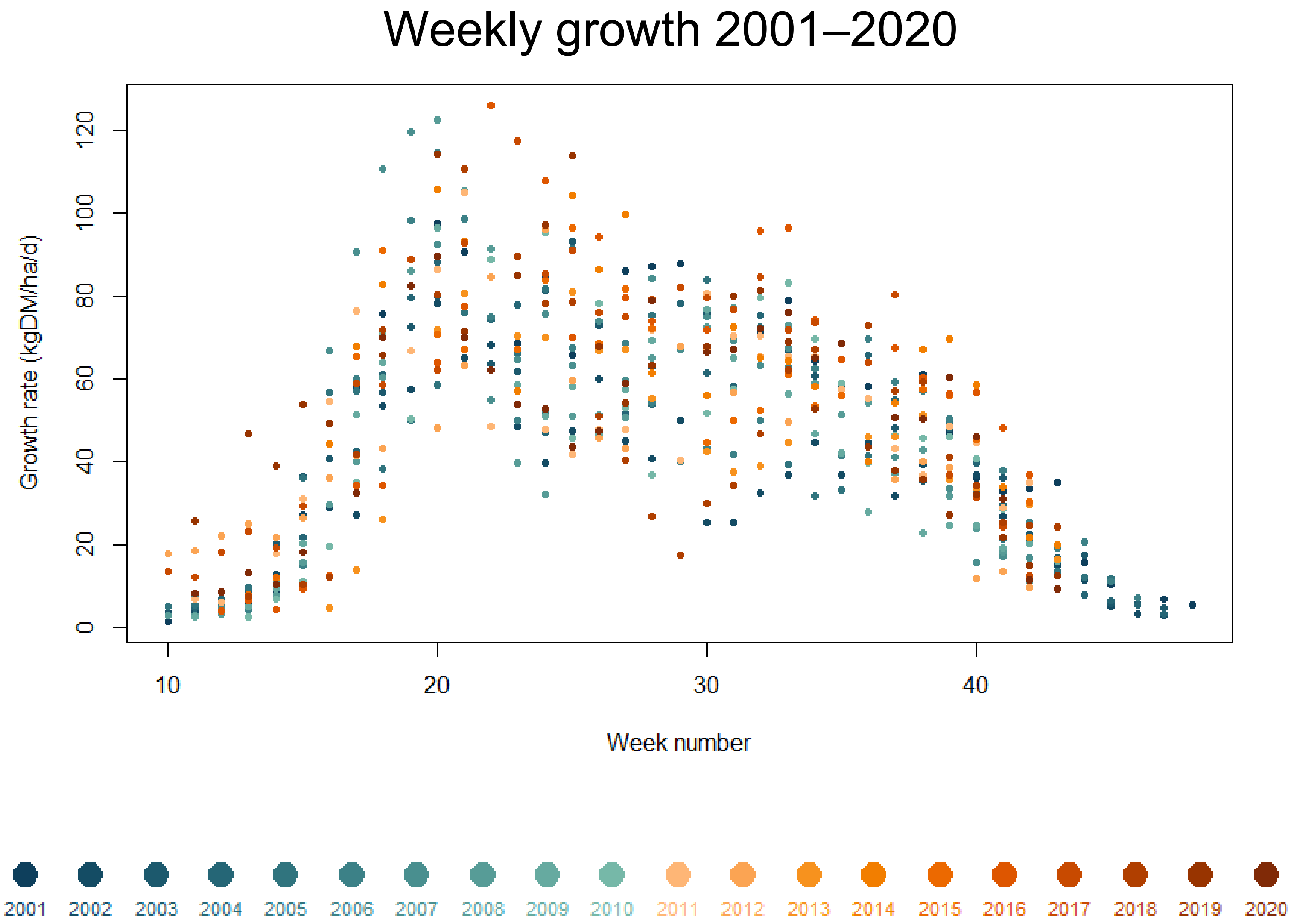

Separating climate effects from weather effects

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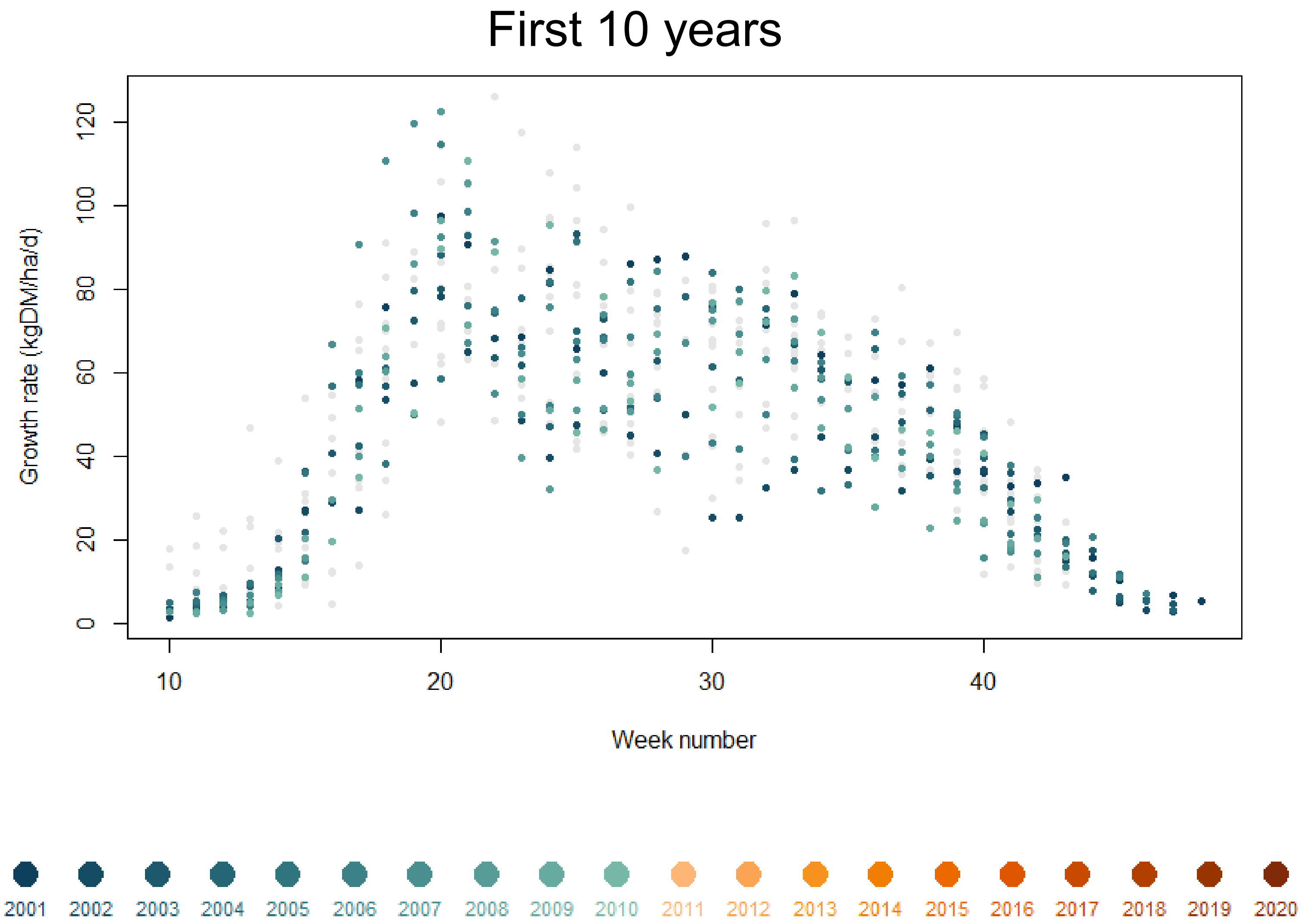

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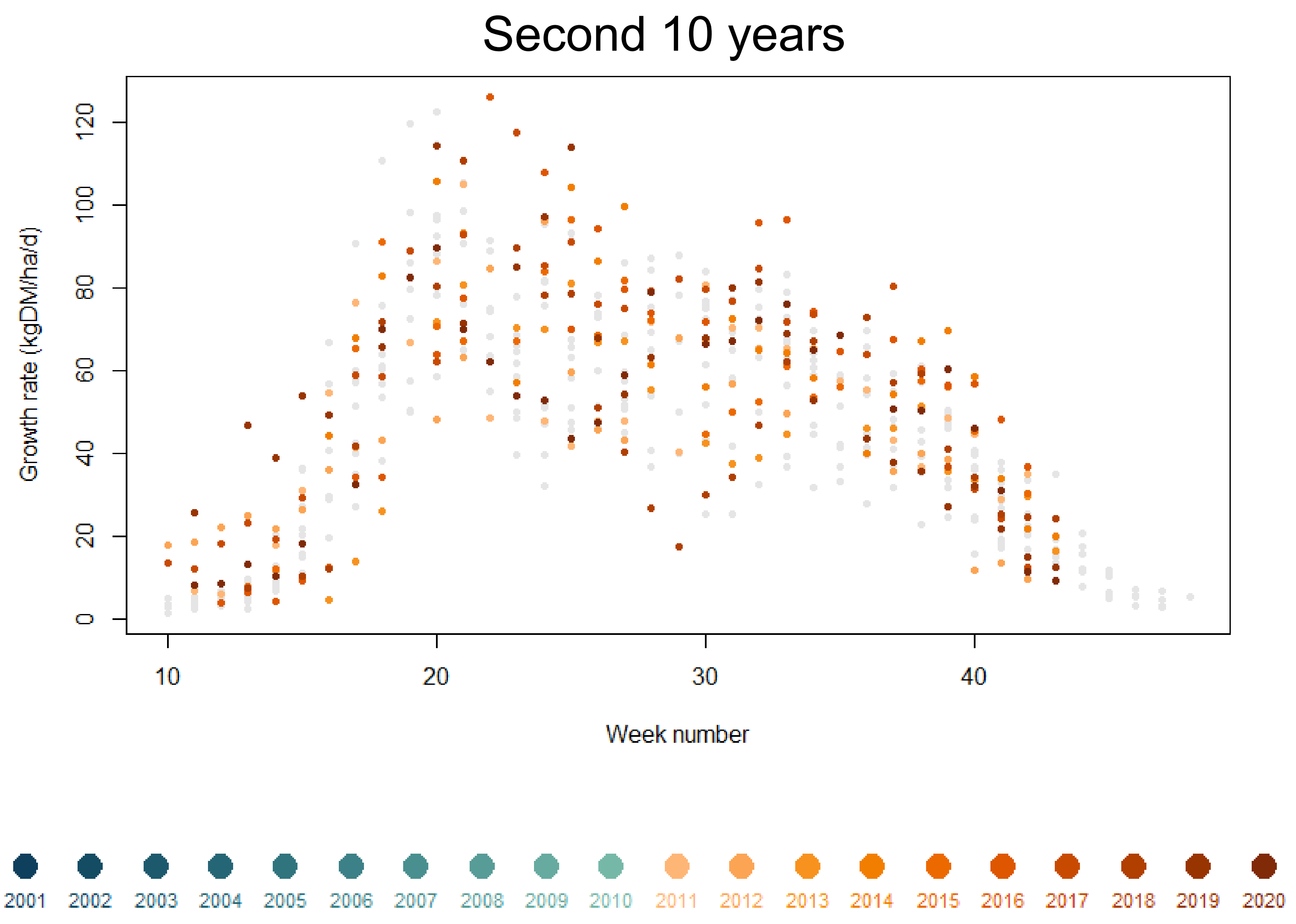

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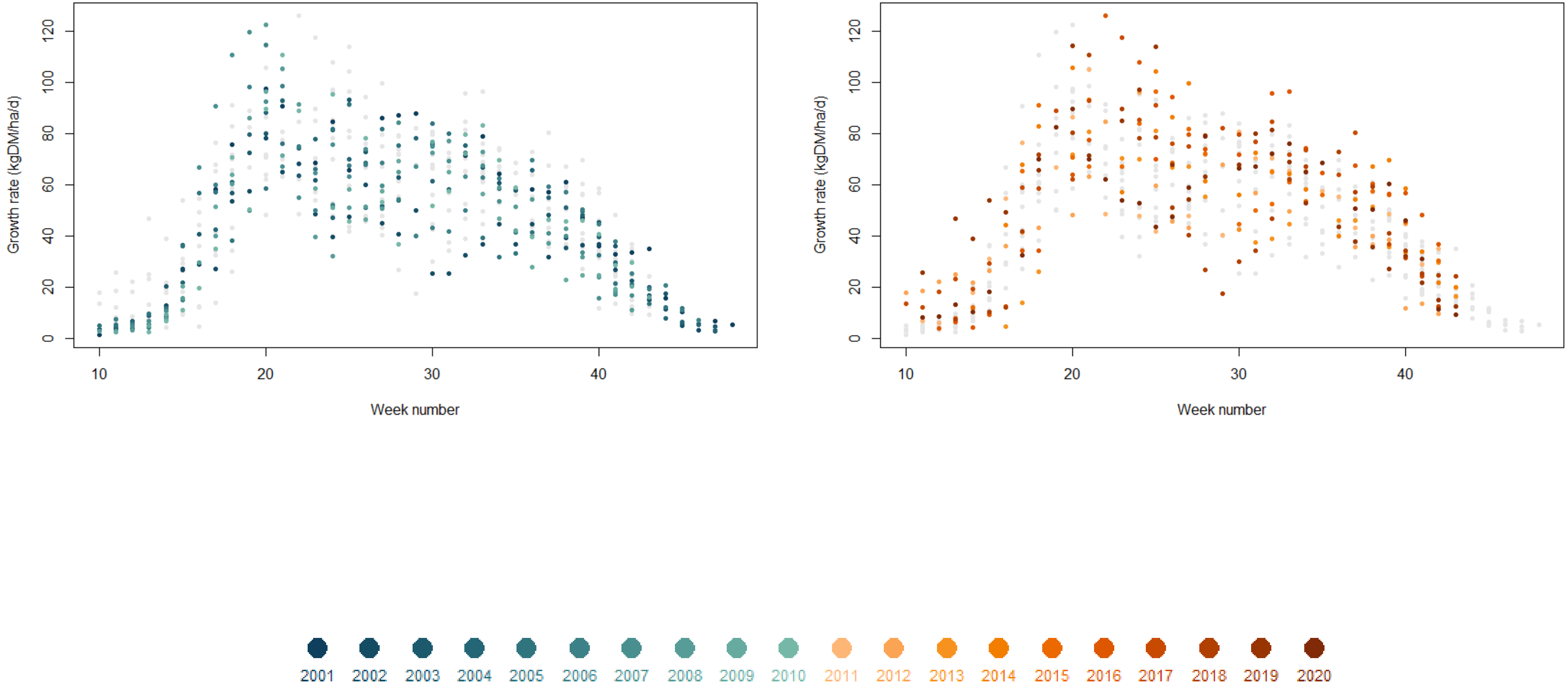

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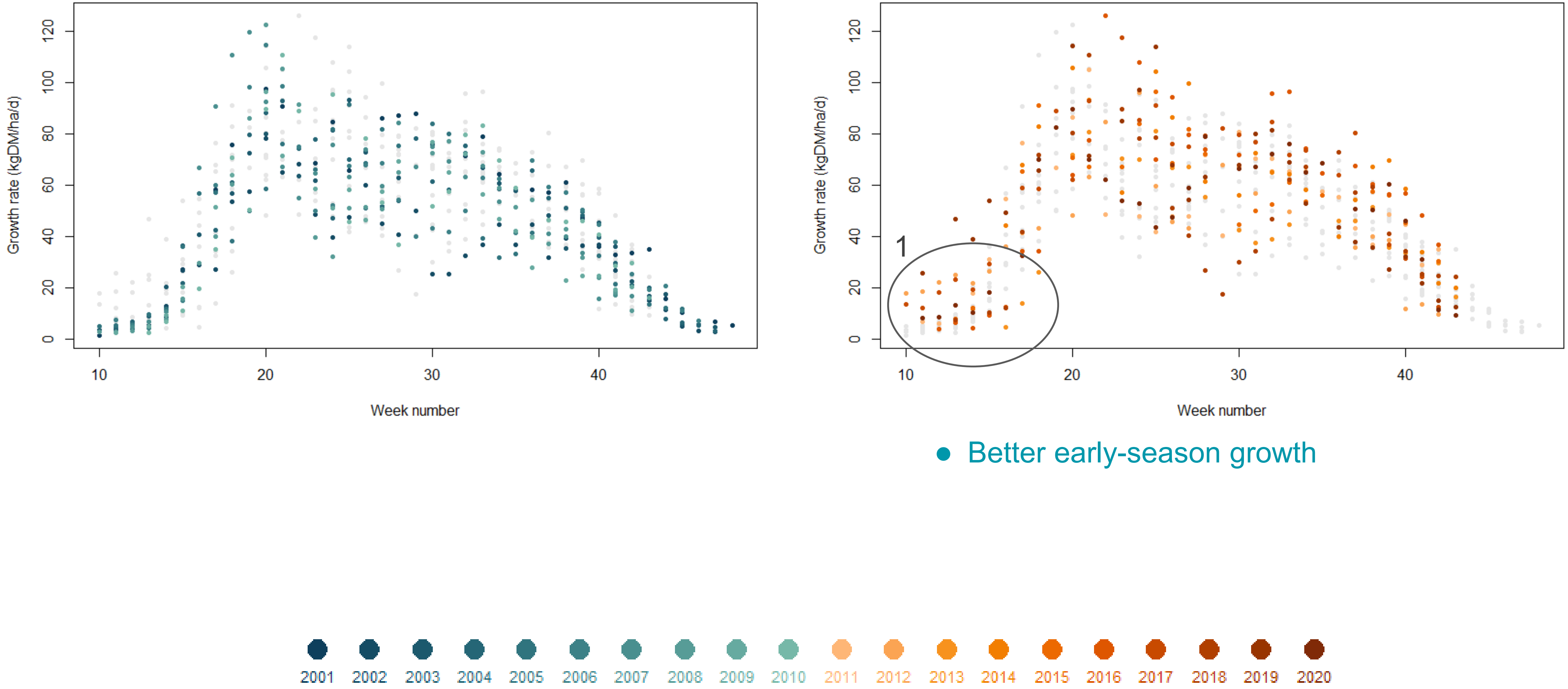
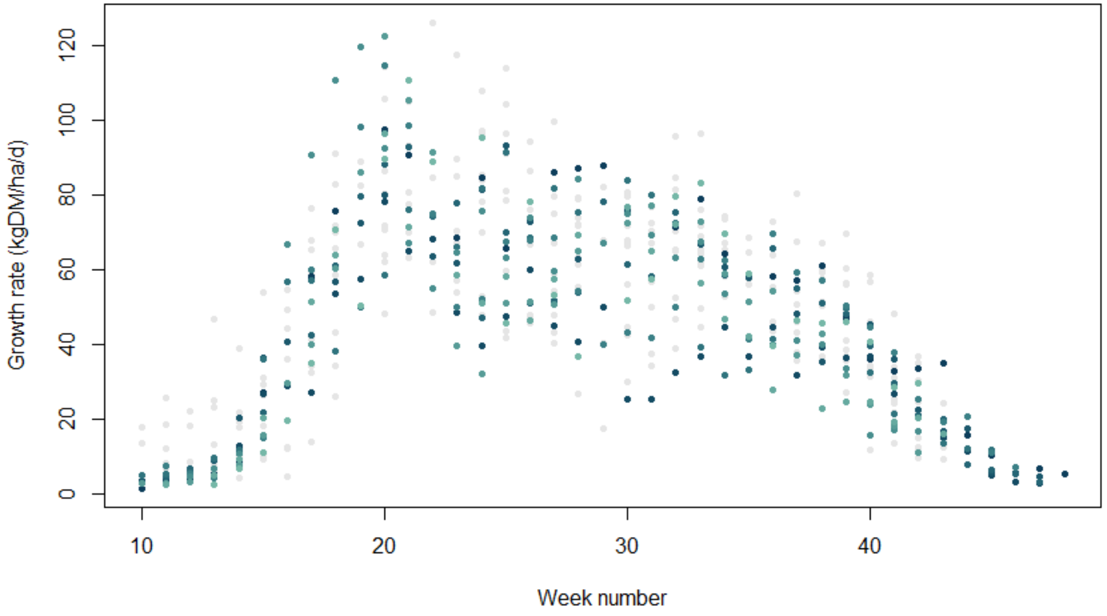
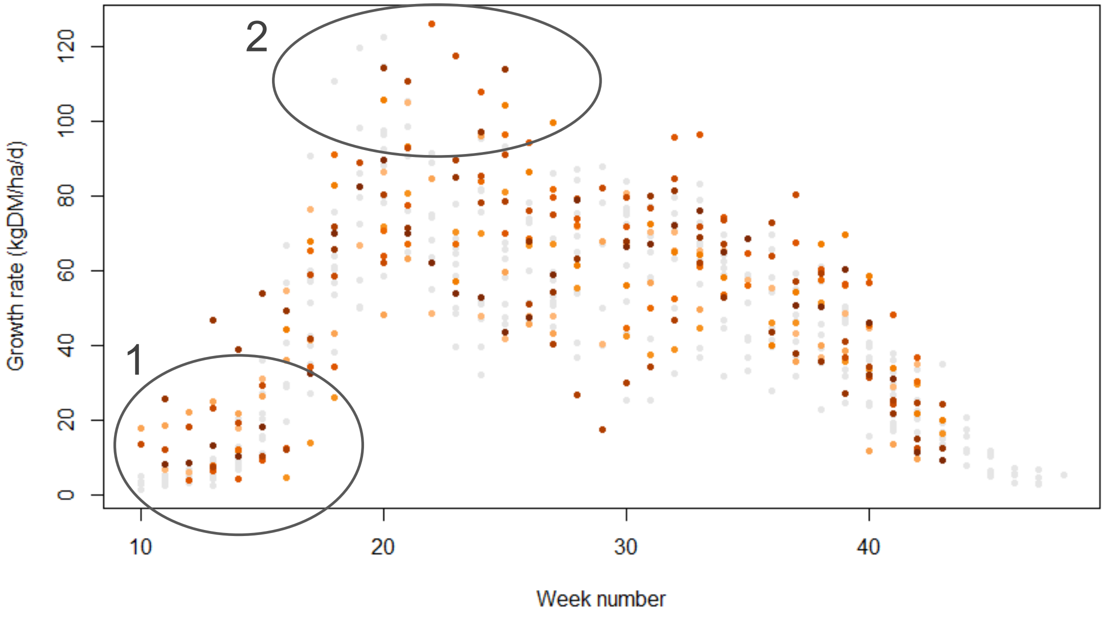


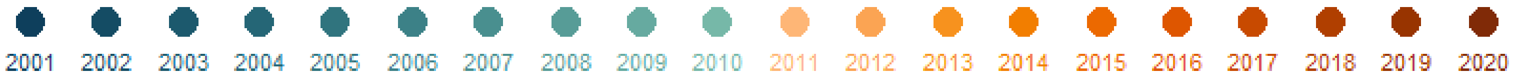
- Better early-season growth

Separating climate effects from weather effects





- Better early-season growth
- Later peak



Separating climate effects from weather effects

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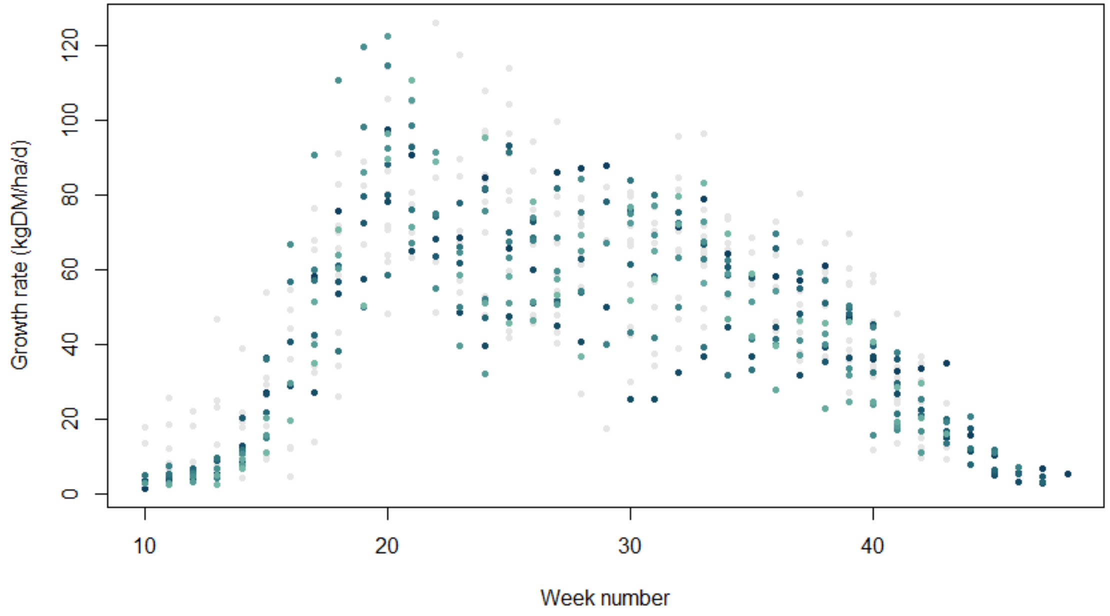
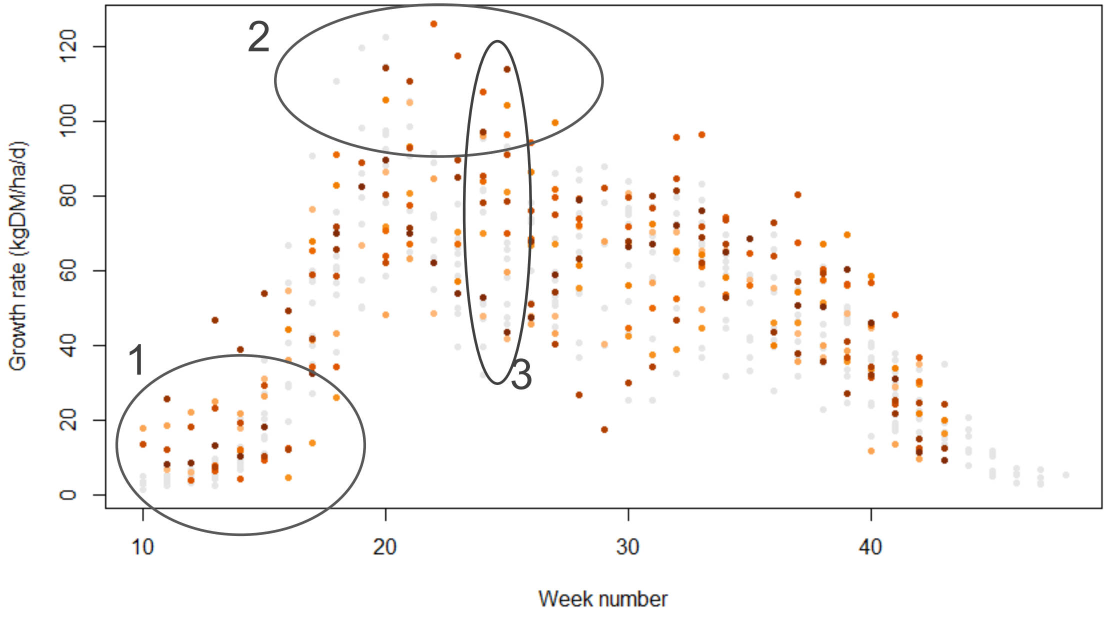
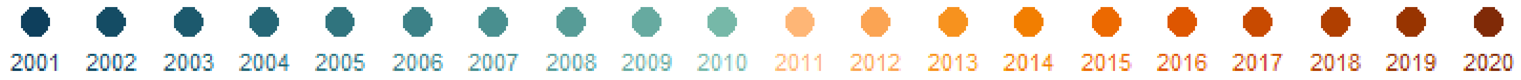




- Better early-season growth
- Later peak
- Greater between-season variability in summer



25 years of knowledge and data

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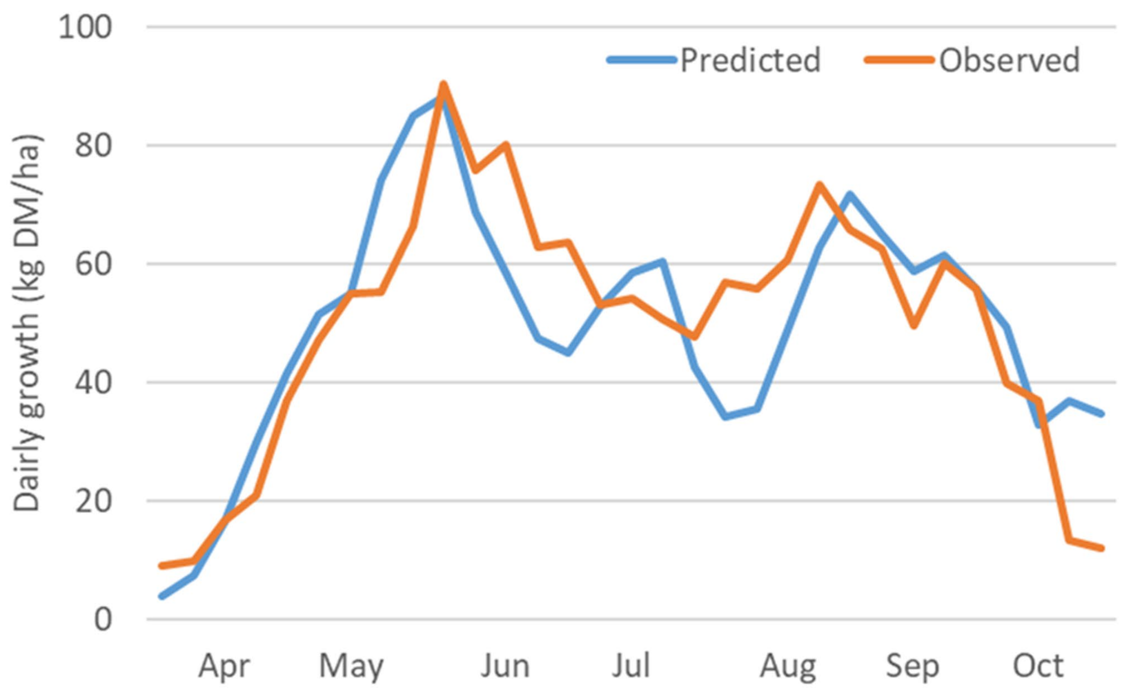
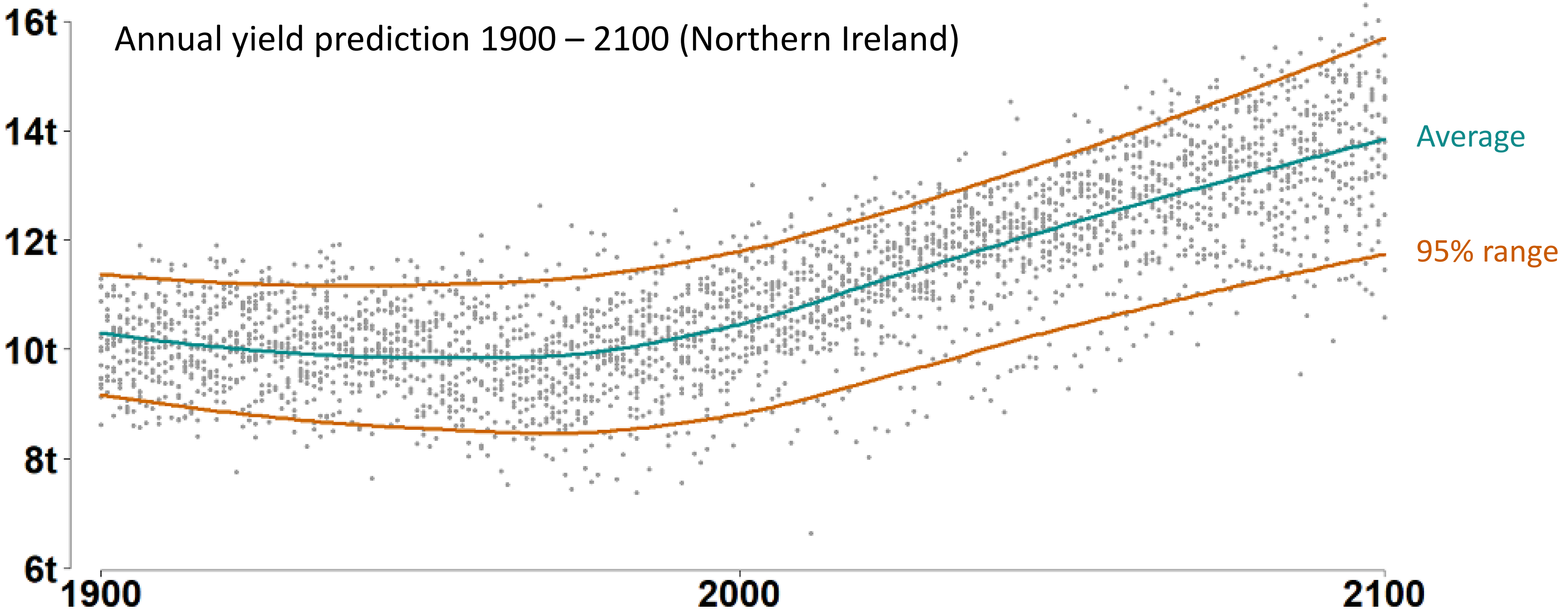
Performance of GrazeGro model (2023)



- Average error of our grass growth forecasting: 12.2 kg/ha/day
- As good as (or better than) most competitors and, more importantly, the level of errors unlikely to trigger wrong on-farm decisions

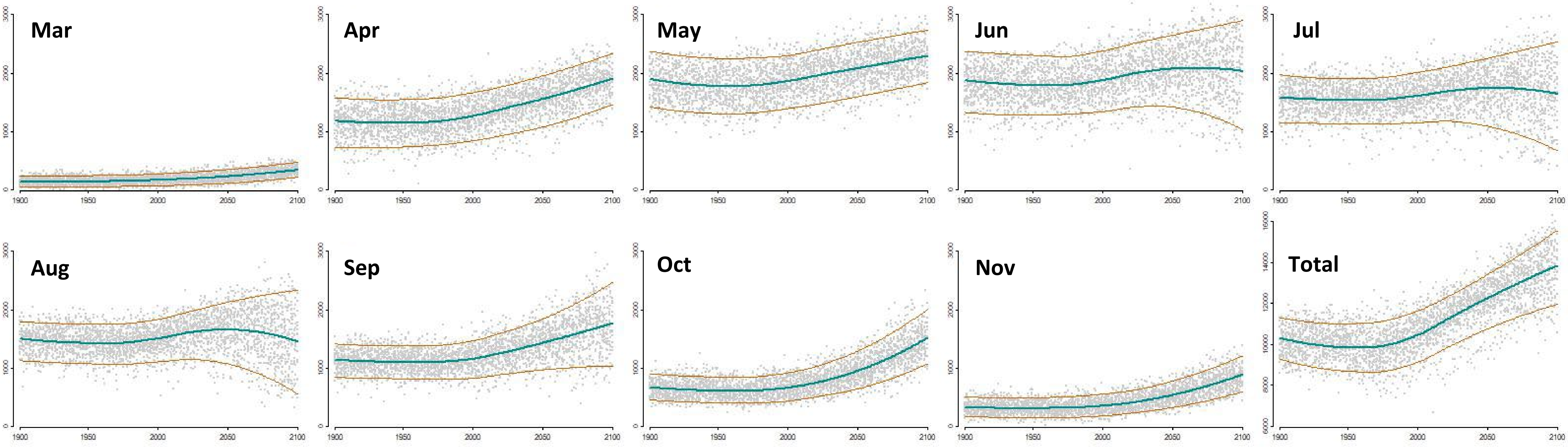
Preparing for the future



Based on UK Met Office UKCP18 climate projections
(15 weather patterns x 200 years)

Preparing for the future

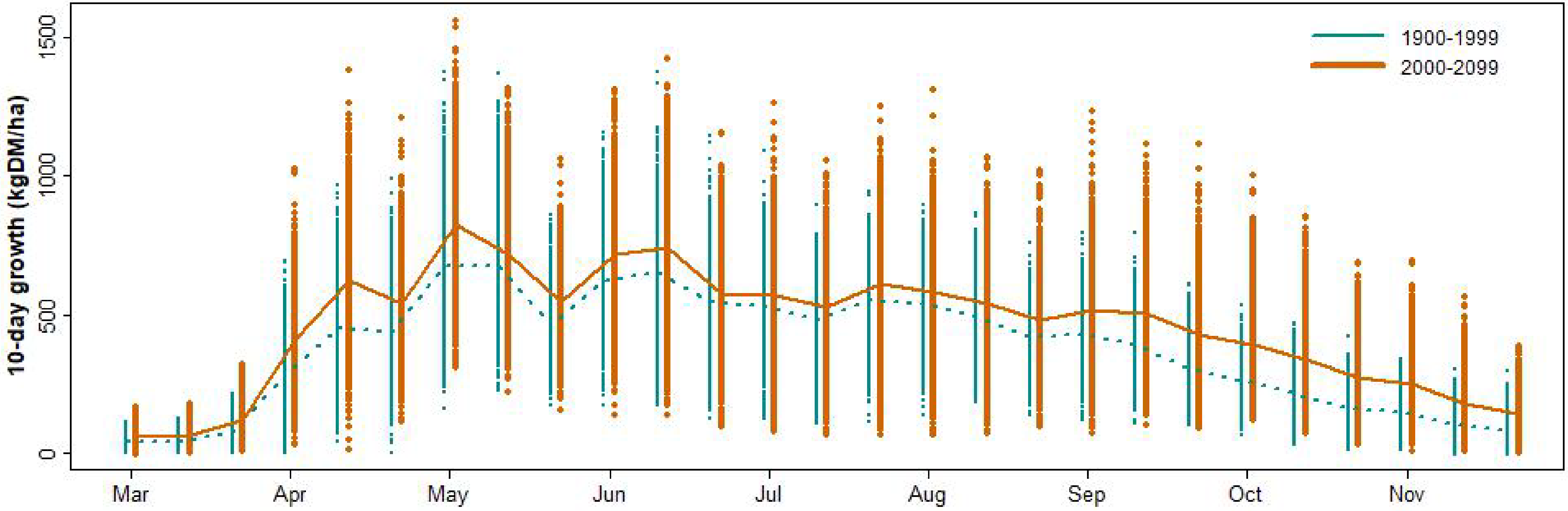
Monthly yield prediction 1900 – 2100 (Northern Ireland)



- Better growth in early spring and late autumn
- More volatile and often lower growth in mid-summer

Preparing for the future

10-day yield prediction 1900 – 2100 (Northern Ireland)



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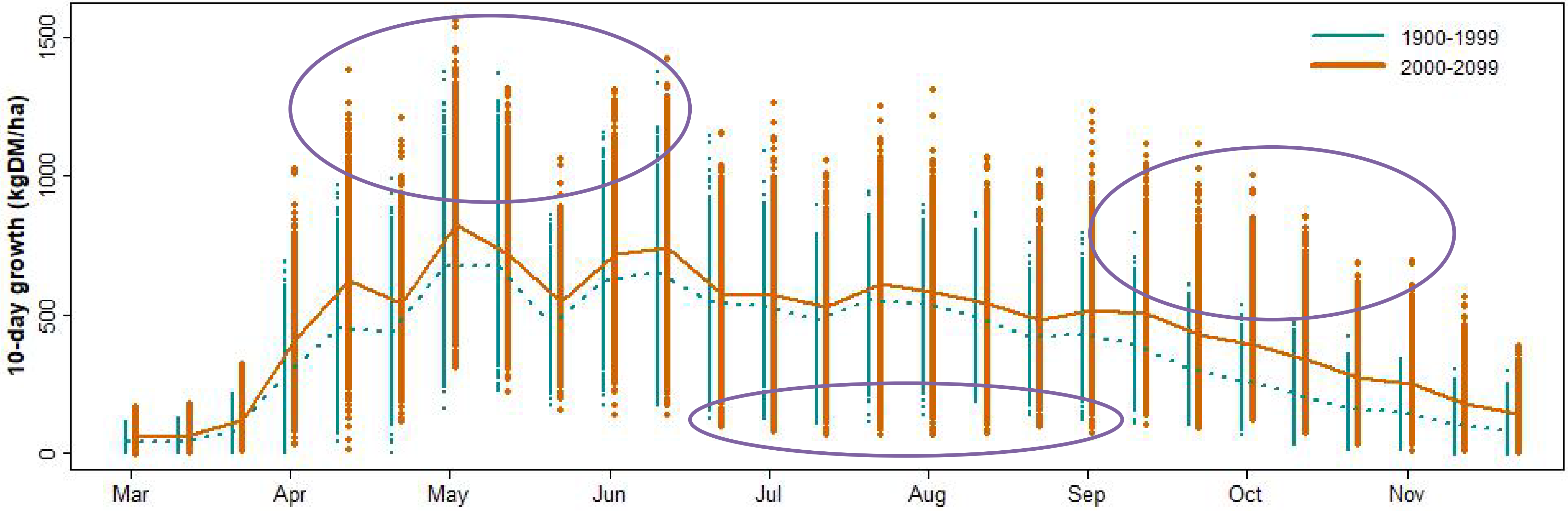
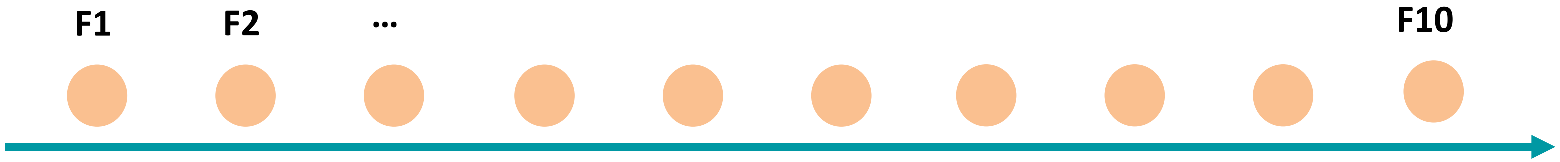


- ❖ Better growth in early spring and late autumn
- ❖ More volatile and often lower growth in mid-summer

What volatility means in real term

GrassCheck fertilisation regime (270 kg N)



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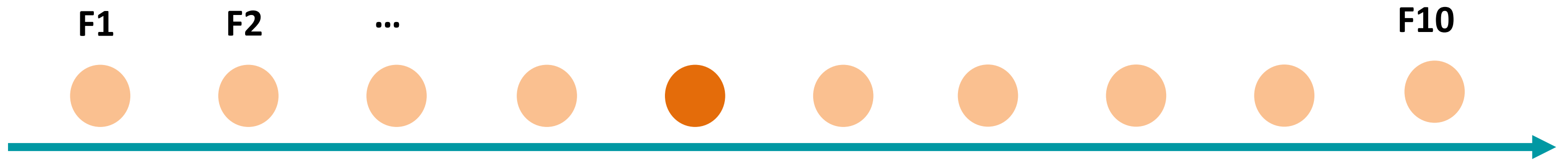
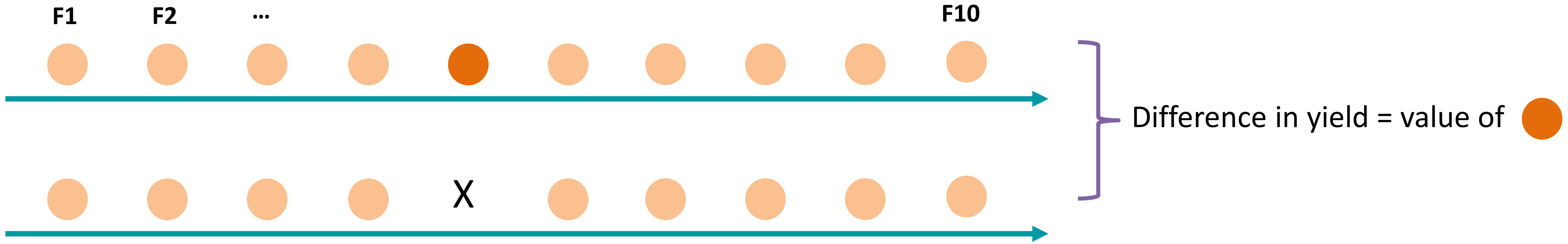


value of ?

What volatility means in real term

GrassCheck fertilisation regime (270 kg N)



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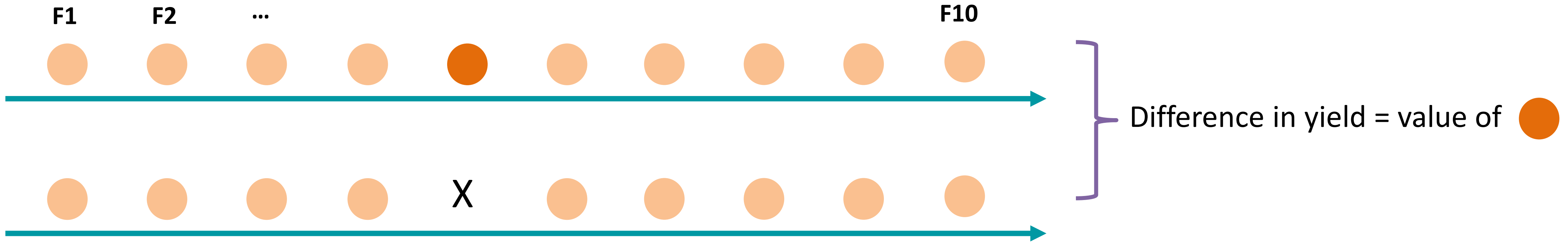


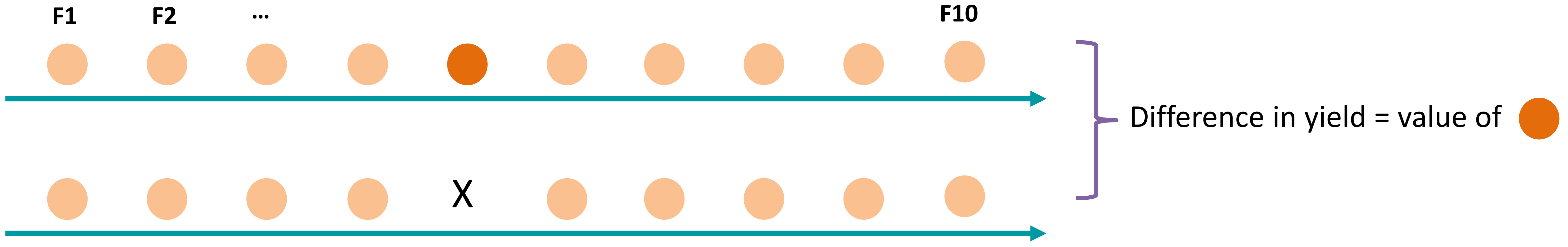
Probability of “nil return”

Value of	2024	2100
< 100 kg DM	No case	2.7%
< 200 kg DM	5.3%	16.7%
< 300 kg DM	22.0%	30.7%

Based on UK Met Office UKCP18 climate projections (15 weather patterns x 10 fertilisation timing)

What volatility means in real term

GrassCheck fertilisation regime (270 kg N)



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Key to climate adaptation
= management of "nil return" risks

(more in the next presentations)

Based on UK Met Office UKCP18 climate projections (15 weather patterns x 10 fertilisation timing)

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Exciting new development for 2025

- ❖ County-by-county 7-day forecast
- ❖ More advice on fertilisation
- ❖ Improved predictions under drought
- ❖ AgriSearch PhD 1 — Carbon footprinting of GrassCheck network farms (started in Oct 2024)
- ❖ AgriSearch PhD 2 — Expansion of GrassCheck climate adaptation model to inform agronomy and grass breeding (starting in Dec 2024)

taro.takahashi@afbini.gov.uk

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Sward Adaptation & Farm Resilience

David Patterson

November 2024

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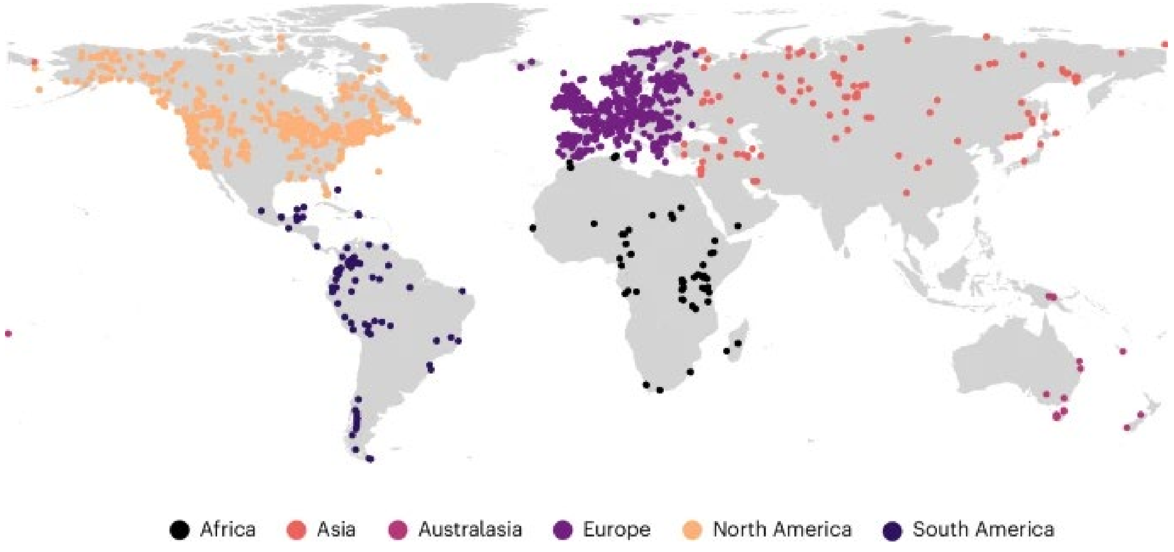
Consequences of climate change for grassland?

Challenges and opportunities for grassland restoration: A global perspective of best practices in the era of climate change
Global Ecology and Conservation Volume 46 2023



Climate Warming Consistently Reduces Grassland Ecosystem Productivity
Earths Future Volume 9 2021

Rapid shifts in grassland communities driven by climate change
Nature Ecology & Evolution (2024)

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Consequences of climate change for grassland?

IRISH FARMERS JOURNAL
Saturday 19 October 2024

IRISH FARMERS JOURNAL
Saturday 19 October 2024

Examining the long-term trends in grass production

There may be a need to focus research on the relative lean weeks at the beginning of the grazing season, writes **Prof Gerry Boyle**

I don't need to tell anyone that this has been a difficult year for grass production and management. It's a natural inclination when we experience a bad weather event to treat it as a once off, or, short-lived episode with the expectation that matters will soon revert to normal.

However, with climate change, the fear is that such events may recur with a greater frequency than in the past and hence we've to learn to adapt to these changing circumstances. We're fortunate in this country that climate change has so far not affected us as dramatically as we see now so tragically in other countries.

The prevalence of extreme events, storms and so on, are obvious but more longer term weather factors may be less so.

Patterns

Rainfall and temperature patterns are critically important in the production of all crops, including grass. Underlying shifts in these factors may require farmers to change their management systems to optimise production conditions.

I thought it was worth standing back from recent developments in grass production and taking a longer term look. Fortunately Michael O'Donovan, and his team at Teagasc Moorepark, have set up PastureBase Ireland (PBI) which provides farmers with a digital tool to assist them in managing their grass resources.

This tool, aided by programmes such as Grass10 and supported by advisers, enables farmers to make the most of their grass. It's disappointing, however, that more farmers don't make better use of PBI.

Gerry Boyle. \ Dave Ruffles

PBI has assembled a huge database of grass production data from all over Ireland which contains extraordinary detailed information on growth. I've been examining trends and patterns in this data on weekly growth (kg DM/ha/day) performance going back to 2013.

Data is available for each year from the week beginning 27 January to 1 December (45 weeks).

Some interesting long-term patterns emerge from this analysis that I think are worth highlighting. I'm going to focus on data for the Republic as a whole. Naturally variations will exist between regions and indeed, within regions, of the country. I'm working on the proposition that if strong trends are evident at the national level they should be amplified at a regional level.

The annual average weekly grass growth over the 12 years has been about 41.5kg DM/ha/day, or averaged over 45 weeks about 13t per year. Surprisingly there has been a slight downward trend in the average weekly production of about 0.5kg DM per year. Relative to the average weekly level of production, this is only about 1%.

> "Farmers are very familiar with the seasonal grass production chart which looks like an upside down 'U'

Farmers are very familiar with the seasonal grass production chart which looks like an upside down 'U'.

When several yearly grass curves are stacked on top of each other, it looks like there's a lot of inter-year variation.

Most of this is just noise. When you systematically measure variation by comparing the weekly growth variation in each year, relative to the average for that year, you find remarkable stability, with one exception.

No prizes for guessing the outlying year. Naturally it's 2018.

For all other years, the inter-week variation, standardised for weekly average level of growth, is very similar.

The annual average weekly grass growth over the 12 years has been about 41.5kg.

Dip in growth throughout the month of June and into July

In summary, over the long run, weekly grass growth trends are negative for 35 weeks and positive for 10 weeks. The biggest absolute dip in growth occurs throughout June and the first two weeks of July. The biggest relative decline (benchmarked against the LTA of grass growth for the weeks concerned) occurs from the last week in January to the first week of March.

Having sweated over the numbers set out above, the reader may ask, so what? It seems to be that there may be a need to focus research on the relative lean weeks at the beginning of the grazing season. Of course the development of strategies to enable better grass utilisation in difficult weather conditions is also required.

I think it's worthwhile for every farmer to sit down with their adviser, and examine the long-term growth rates on their own farms. This exercise can greatly assist year-to-year and longer-term planning.

Negative trend

It's particularly interesting to examine the weekly long-term trends in grass production. From the last week in January to the first week in March, there's a fairly strong negative trend that ranges from about 2% of the long term average (LTA) for the respective weeks to about 10%. Positive growth trends emerge for the remaining four weeks of March.

Negative weekly trends are again revealed for three of the four weeks of April and also for May and for all of the five weeks of June and up to the second week of July.

For the latter seven weeks, the weekly negative growth rates range from over 1kg to about 2kg. The cumulative negative trend in grass growth for these seven weeks amounts to over 9kg.

The daily growth rate is positive for the last two weeks in July before the trend becomes negative again up to the second week of September. The remaining weeks of September all indicate a positive trend.

For the remaining nine weeks of the growing season, up to the week of 1 December, the trend is again negative for each week.

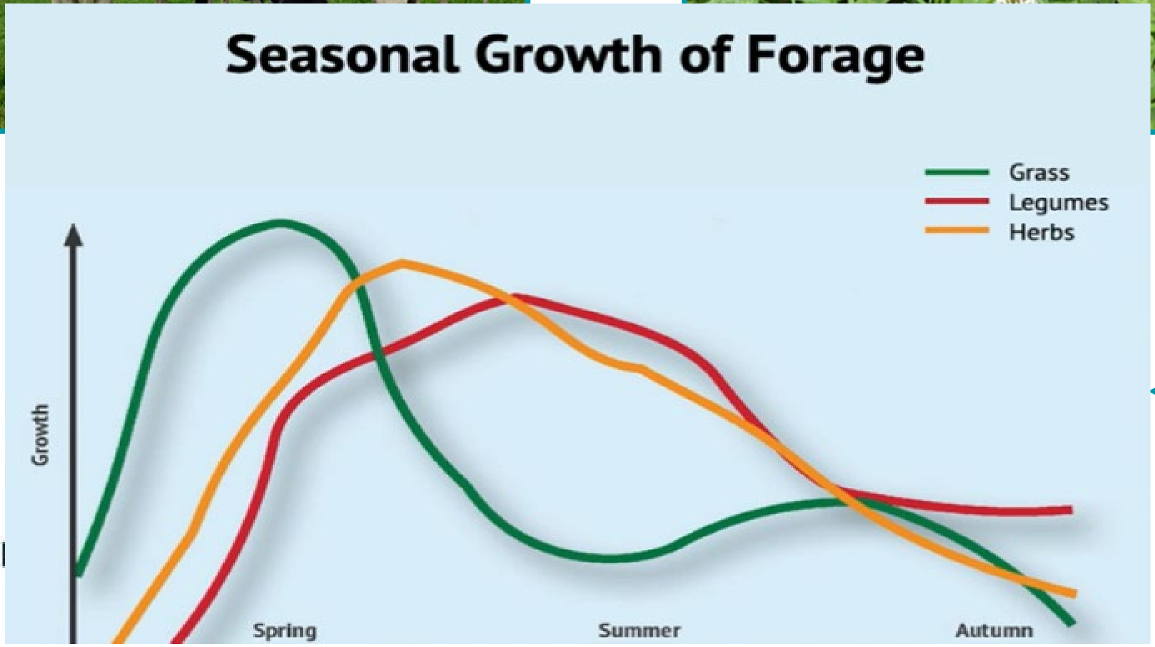
It's possible that lower early-season growth and better mid-season growth may reflect the increased use of grass/clover swards, as some farmers who use PBI may have introduced grass/clover to replace nitrogen fertiliser.

IRISH FARMERS JOURNAL

Can we address future challenges through management and sward adaptations?

Management Options (fertiliser N)

Sward adaptations



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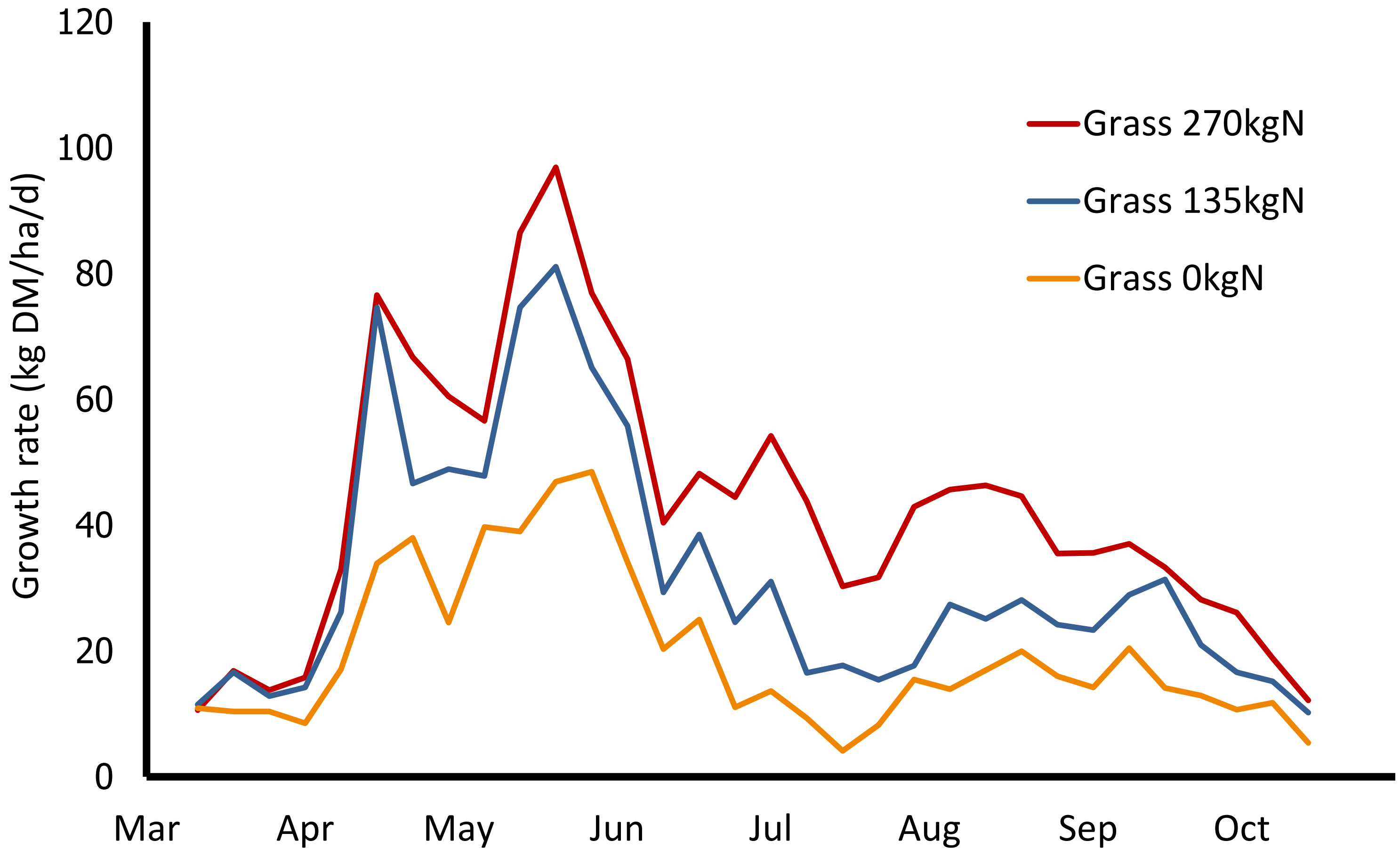
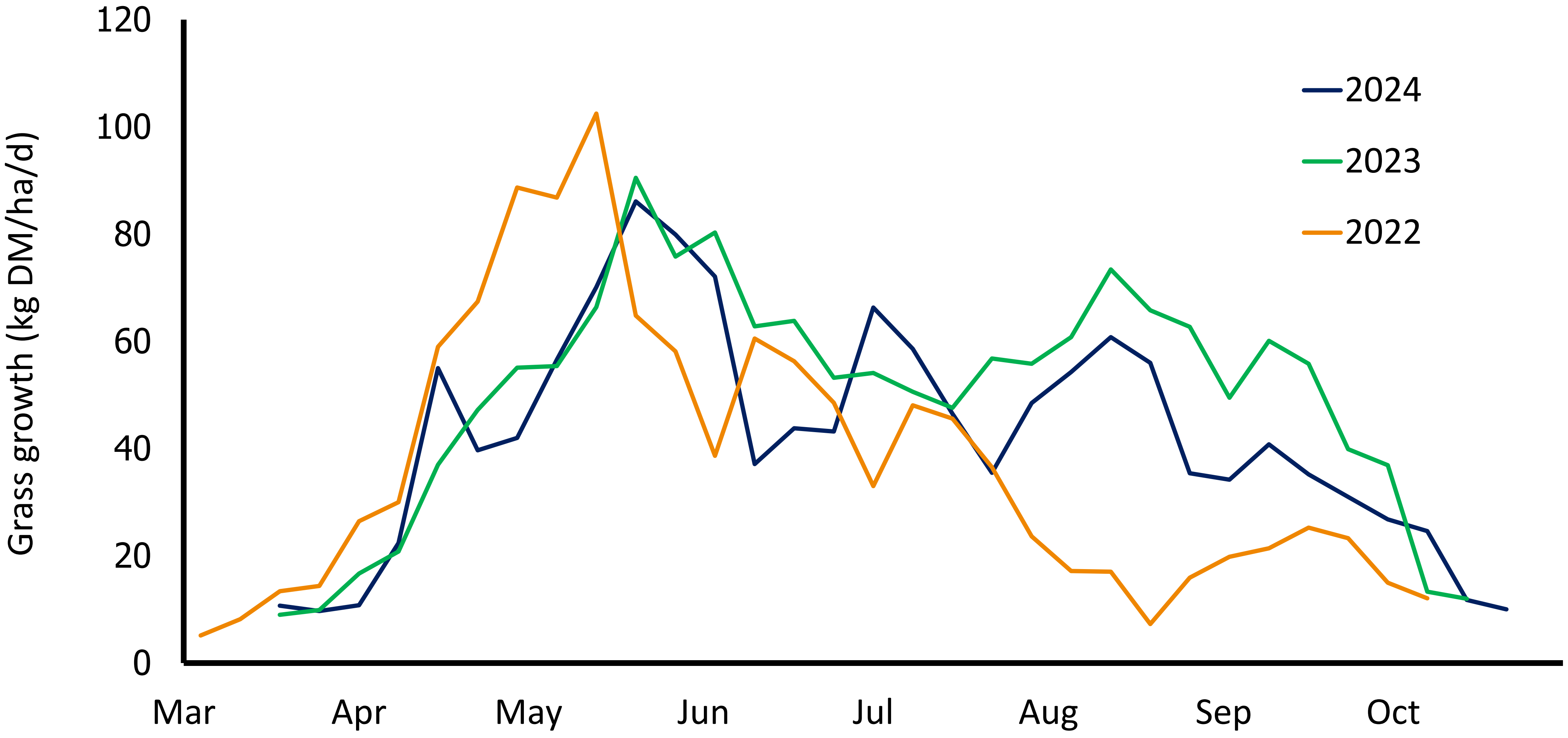
Can fertilizer N modify grass supply?

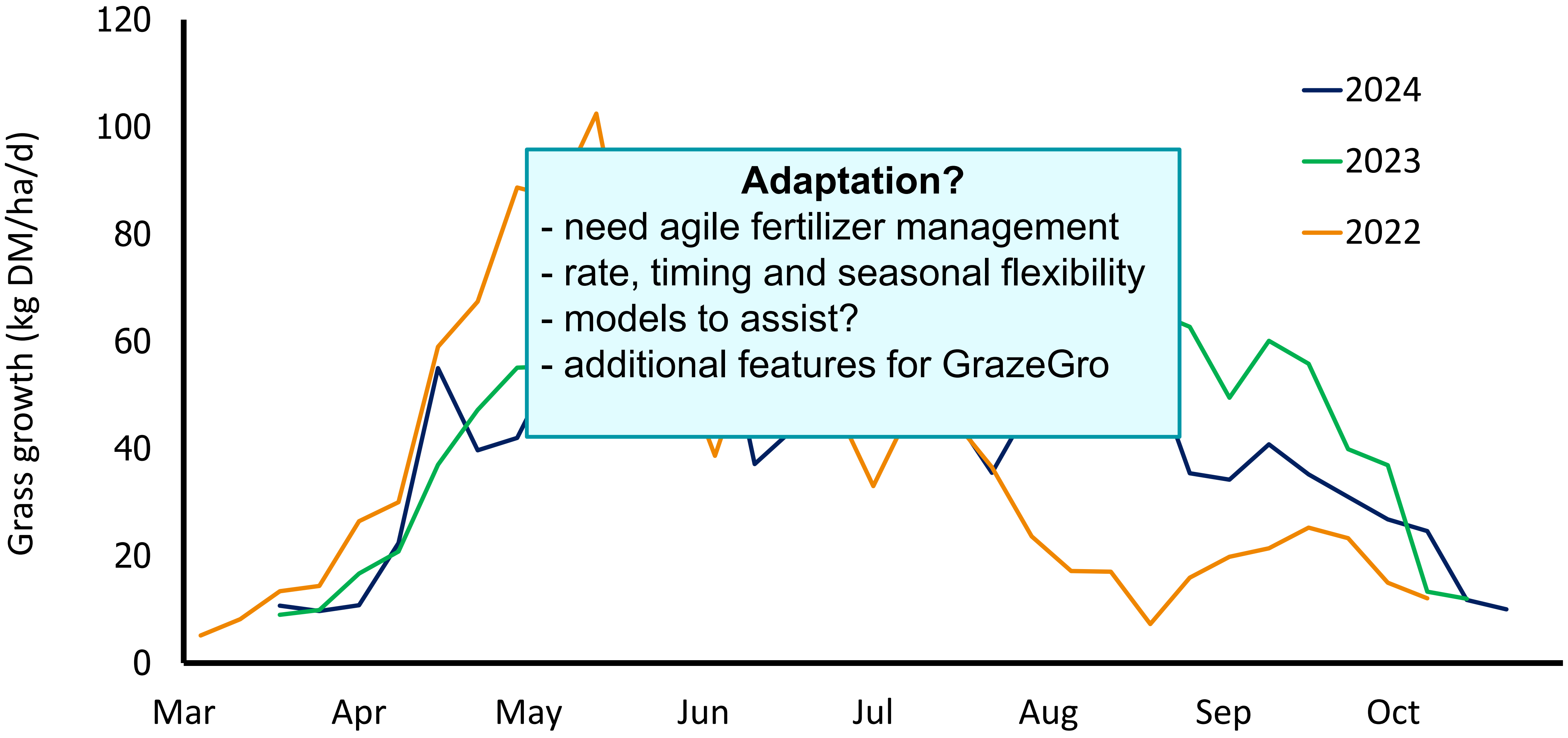


Fertilizer rates	Yield kgDM/ha/yr (kgDM/kgNfert)
Grass + 270kgN	9,635 (19.5)
Grass + 135kgN	7,125 (20.4)
Grass + 0kgN	4,377

Annual Variation: Grass 270kgN



Annual Variation: Grass 270kgN



Adaptation?

- need agile fertilizer management
- rate, timing and seasonal flexibility
- models to assist?
- additional features for GrazeGro

Sward adaptation options

1: Re-evaluate grasses?

2: Other species: legumes, herbs, others?

3: Integration with woodland?

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Sward adaptation options

1: Re-evaluate grasses?

2: Other species: legumes, herbs, others?

3: Integration with woodland?

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Can ryegrass type address spring growth adaptation?

mid April Yield tDM/ha	2024	2023	2022	2021
Hybrid RG	1.96	2.42	2.21	2.10
Italian RG	2.59	2.67	2.11	2.92
Perennial RG (inter)	0.83	0.95	1.40	0.84
Perennial RG (late)	0.61	0.89	0.92	0.68

Can ryegrass type address spring growth adaptation?

mid April Yield tDM/ha	2024	2023	2022	2021	7- 8 cut Annual Yield
Hybrid RG	1.96	2.42	2.21	2.10	17.45
Italian RG	2.59	2.67	2.11	2.92	18.56
Perennial RG (inter)	0.83	0.95	1.40	0.84	9.63
Perennial RG (late)	0.61	0.89	0.92	0.68	9.14

Can grass choice address spring growth adaptation?

mid April Yield tDM/ha	**2024**	**2023**	**2022**	**2021**	**7- 8 cut Annual Yield**
Hybrid RG					17.45
Italian RG					18.56
Perennial RG (inter)					9.63
Perennial RG (late)	[illegible]	[illegible]	[illegible]	[illegible]	9.14

Adaptation?

- extra yield potential despite erratic weather
- extra spring growth aligns with prediction

- n.b hybrids persist 4-5 years (match red clover)
- other species: Tall fescue, Festulolium, Cocksfoot
- complementary growth pattern & deeper rooting

Sward adaptation options

1: Re-evaluate grasses?

2: Other species: legumes, herbs, others?

3: Integration with woodland?

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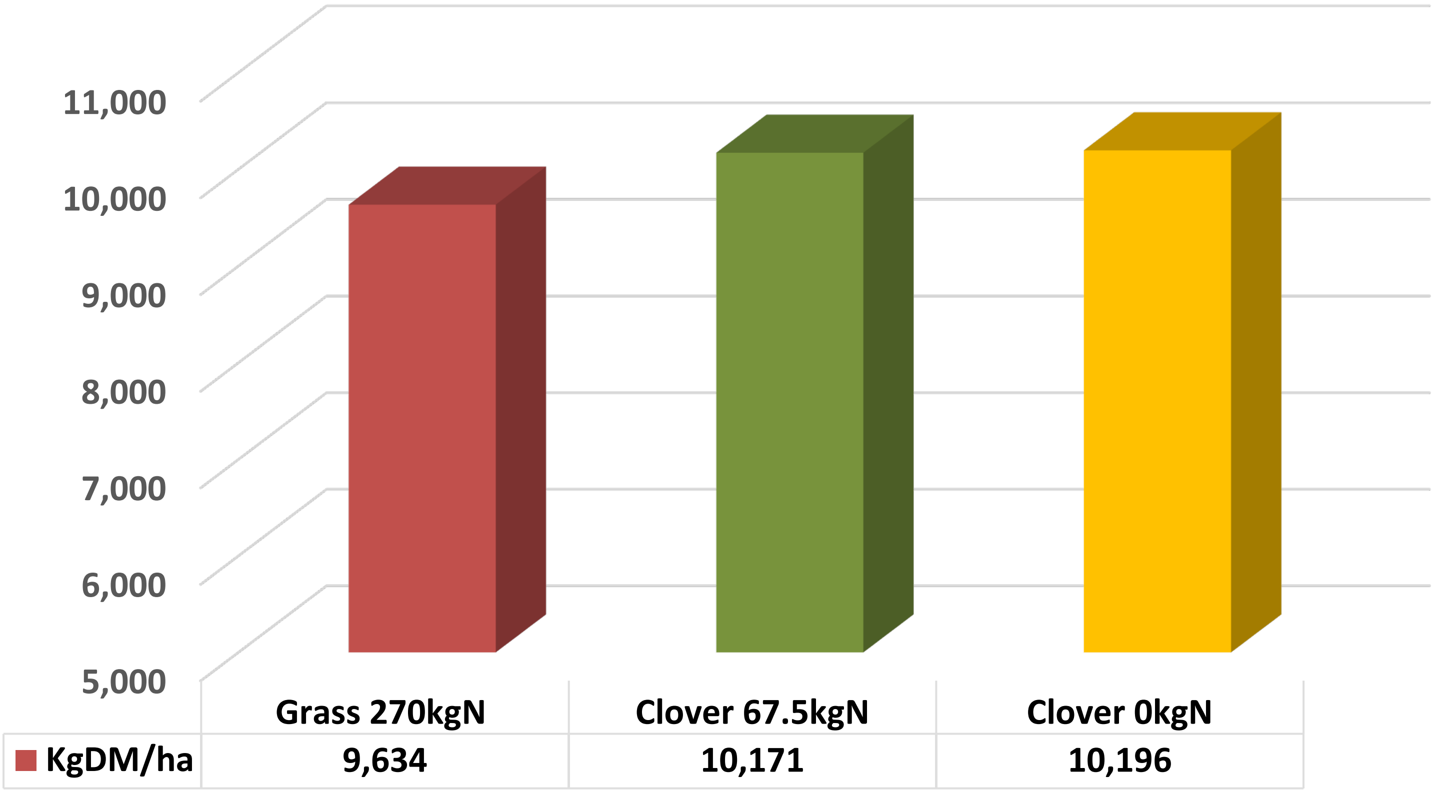
What can grass/white clover deliver?



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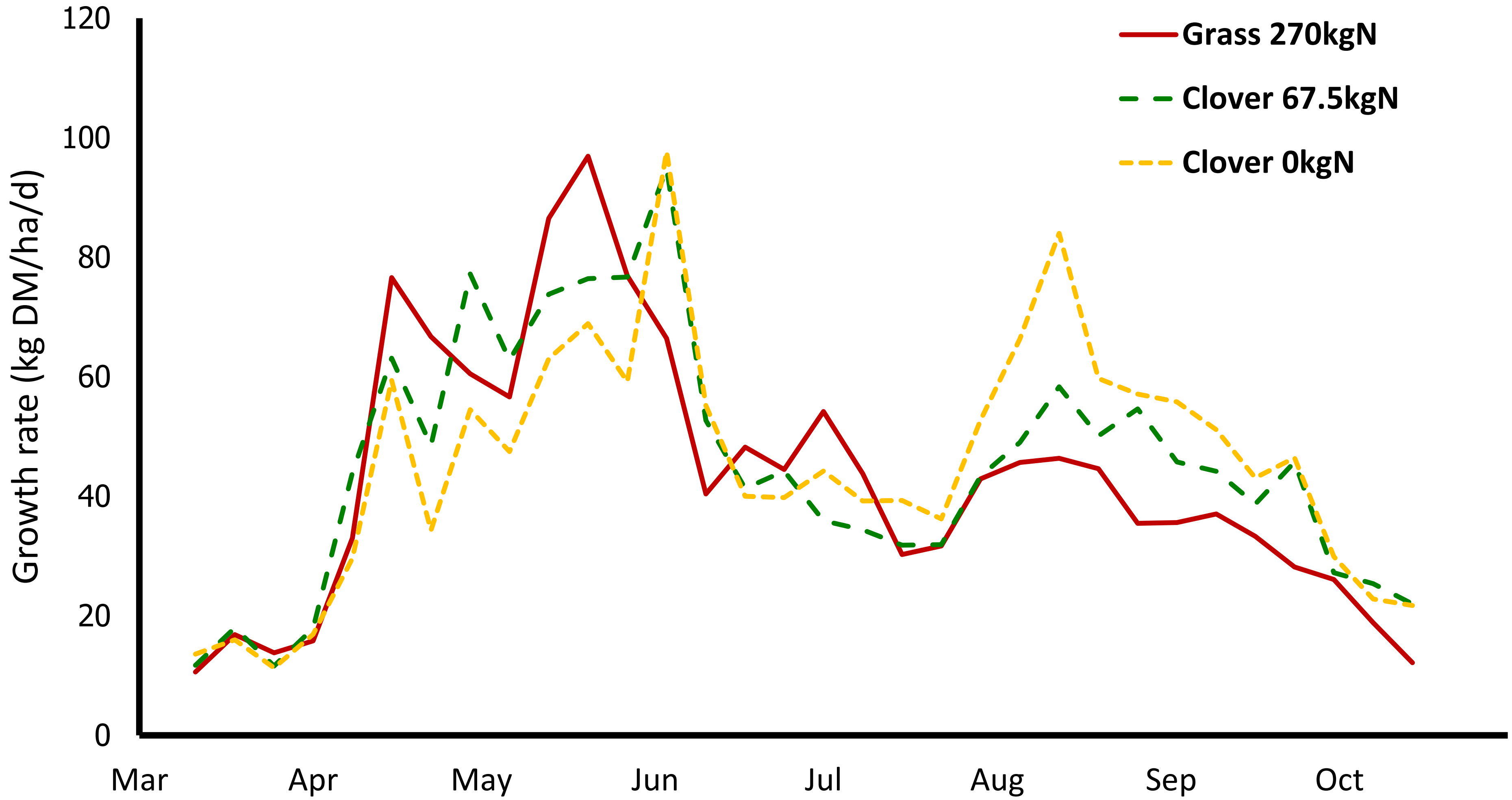
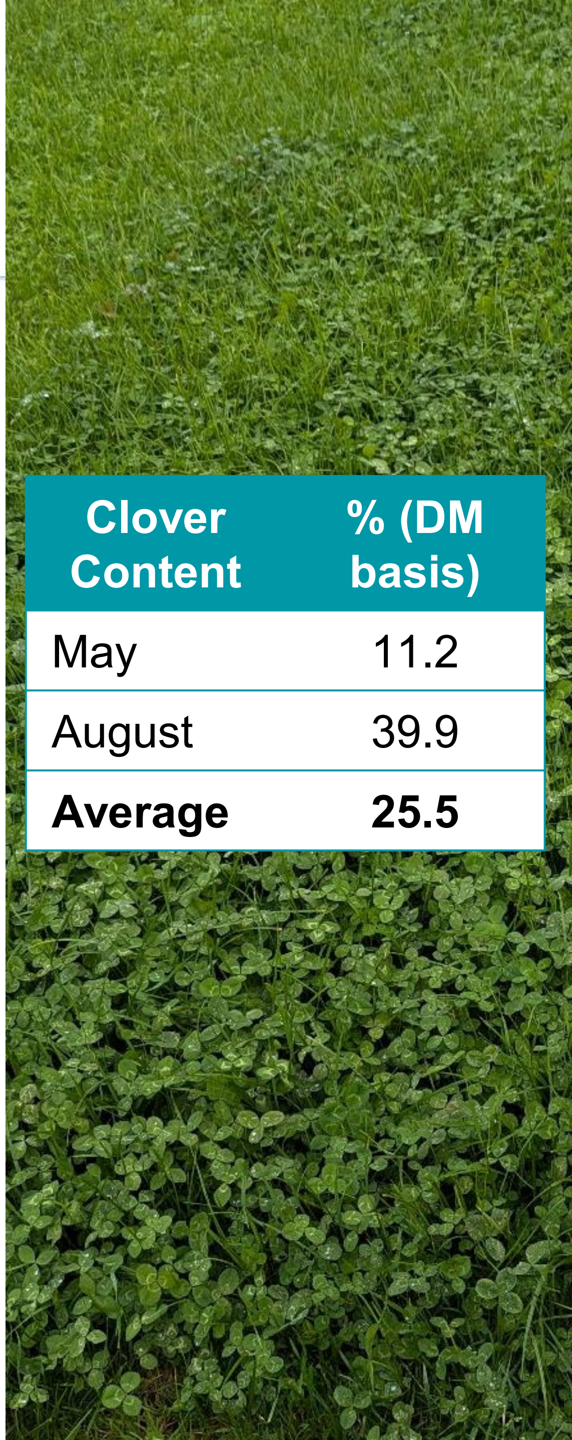
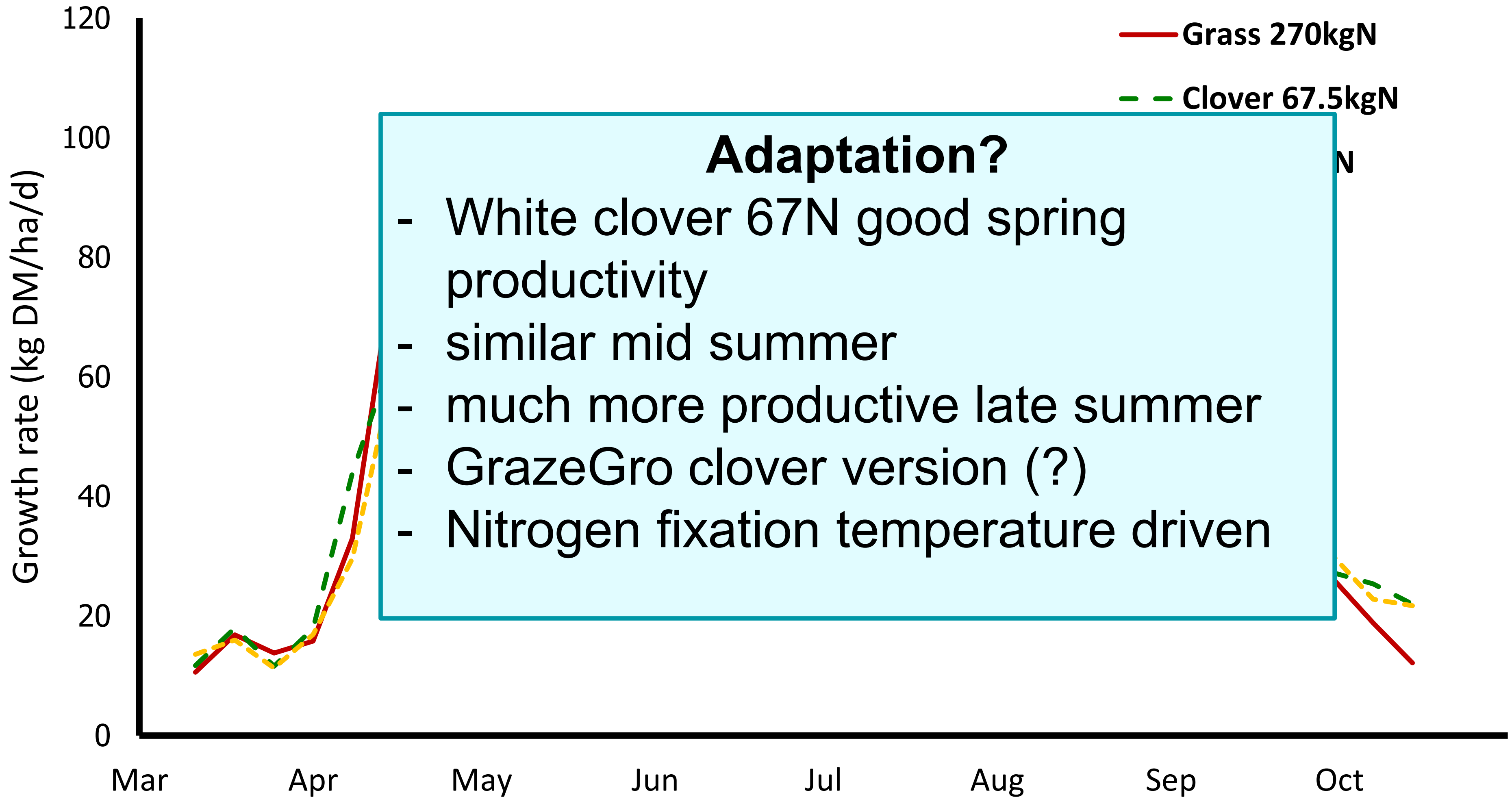
Seasonal Growth Pattern in 2024





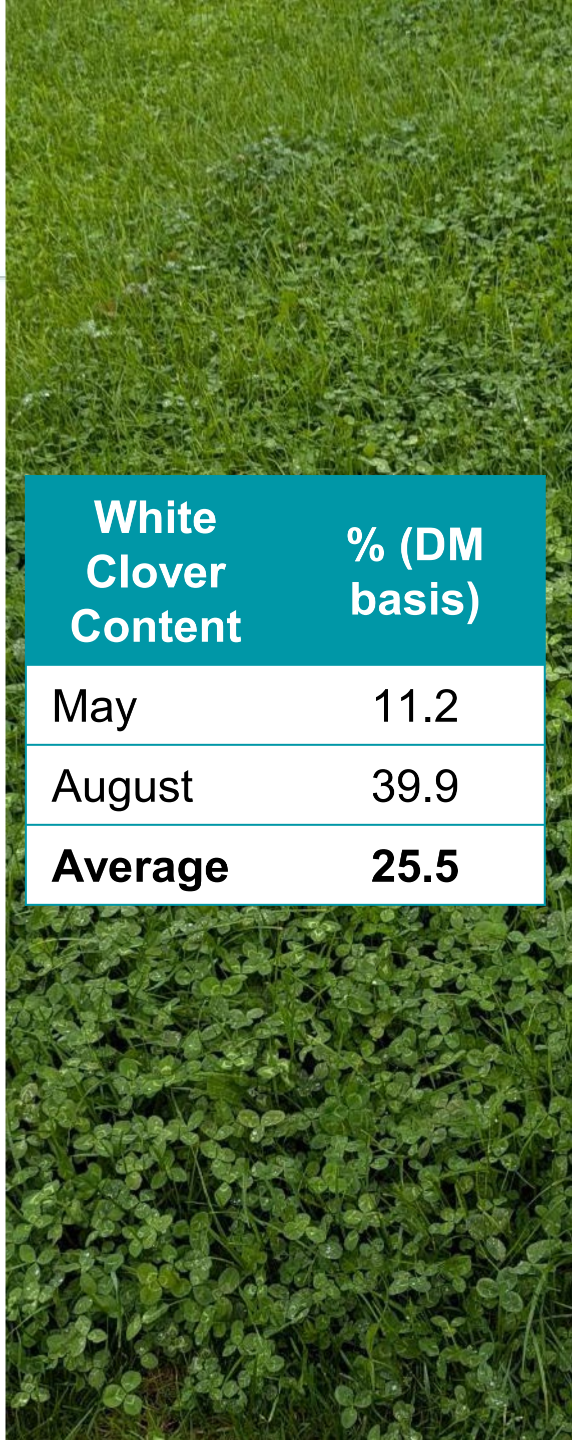
Clover Content	% (DM basis)
May	11.2
August	39.9
Average	**25.5**

Seasonal Growth Pattern in 2024



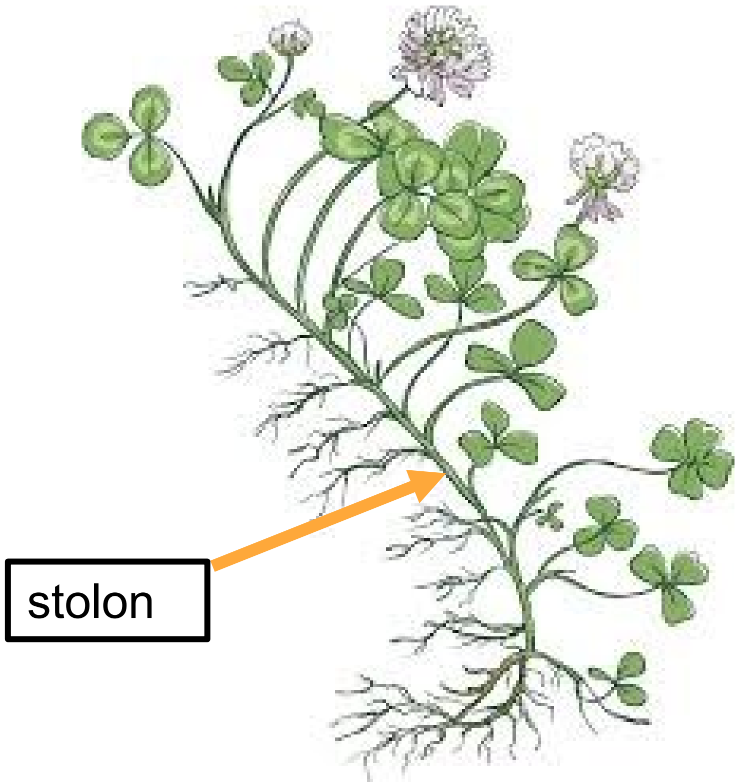
Adaptation?

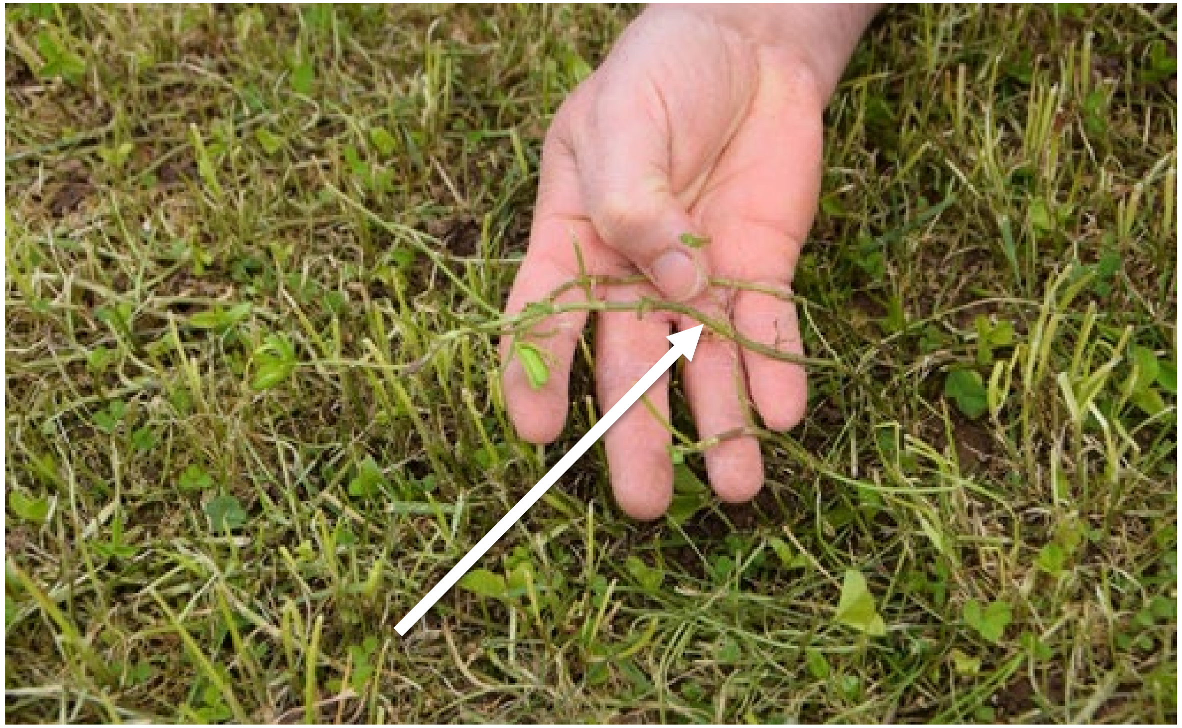
- White clover 67N good spring productivity
- similar mid summer
- much more productive late summer
- GrazeGro clover version (?)
- Nitrogen fixation temperature driven



White Clover Content	% (DM basis)
May	11.2
August	39.9
Average	**25.5**

White clover stolons = sward adaptation





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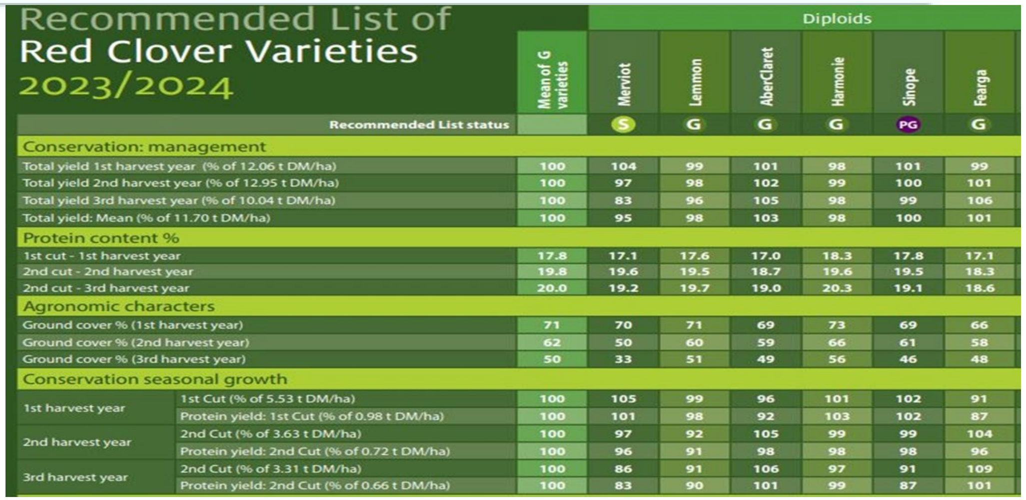
Year	Sward type	DM %	Protein %	Gross Energy %	Yield tDM/ha
2023	Red clover/grass	12.1	17.1	-	-
2023	Grass	12.9	14.2	-	-
2024	Red clover/grass	15.7	14.2	18.2	10.2
2024	Grass	15.8	13.6	18.4	9.35

Red clover – adaptation?



Recommended List of Red Clover Varieties 2023/2024

	Mean of G varieties	Merviot	Lemmon	AberClaret	Harmonie	Sinope	Fearga
		Diploids					
Recommended List status		S	G	G	G	PG	G
Conservation: management							
Total yield 1st harvest year (% of 12.06 t DM/ha)	100	104	99	101	98	101	99
Total yield 2nd harvest year (% of 12.95 t DM/ha)	100	97	98	102	99	100	101
Total yield 3rd harvest year (% of 10.04 t DM/ha)	100	83	96	105	98	99	106
Total yield: Mean (% of 11.70 t DM/ha)	100	95	98	103	98	100	101
Protein content %							
1st cut - 1st harvest year	17.8	17.1	17.6	17.0	18.3	17.8	17.1
2nd cut - 2nd harvest year	19.8	19.6	19.5	18.7	19.6	19.5	18.3
2nd cut - 3rd harvest year	20.0	19.2	19.7	19.0	20.3	19.1	18.6
Agronomic characters							
Ground cover % (1st harvest year)	71	70	71	69	73	69	66
Ground cover % (2nd harvest year)	62	50	60	59	66	61	58
Ground cover % (3rd harvest year)	50	33	51	49	56	46	48
Conservation seasonal growth							
1st harvest year – 1st Cut (% of 5.53 t DM/ha)	100	105	99	96	101	102	91
1st harvest year – Protein yield: 1st Cut (% of 0.98 t DM/ha)	100	101	98	92	103	102	87
2nd harvest year – 2nd Cut (% of 3.63 t DM/ha)	100	97	92	105	99	99	104
2nd harvest year – Protein yield: 2nd Cut (% of 0.72 t DM/ha)	100	96	91	98	98	98	96
3rd harvest year – 2nd Cut (% of 3.31 t DM/ha)	100	86	91	106	97	91	109
3rd harvest year – Protein yield: 2nd Cut (% of 0.66 t DM/ha)	100	83	90	101	99	87	101

Adaptation through species diversity

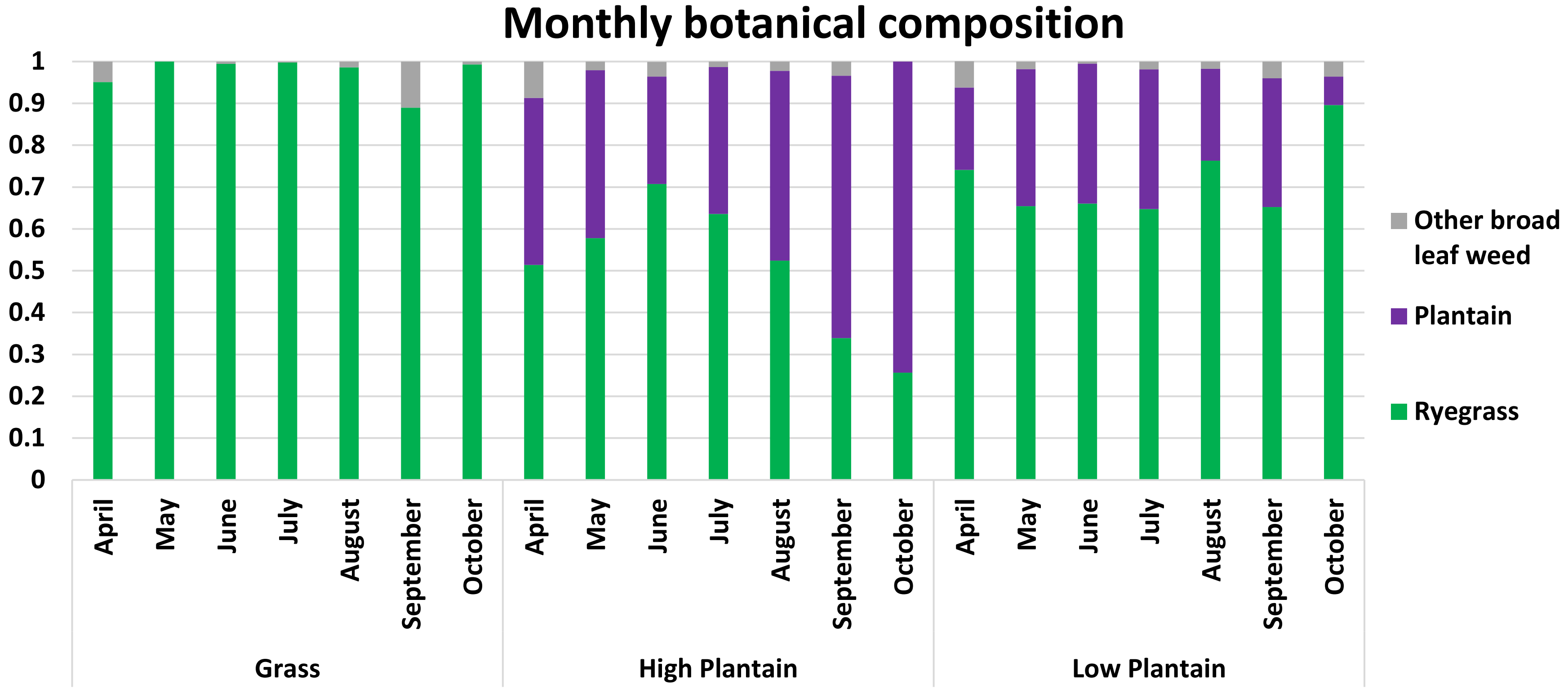
Grass/White Clover

Plantain

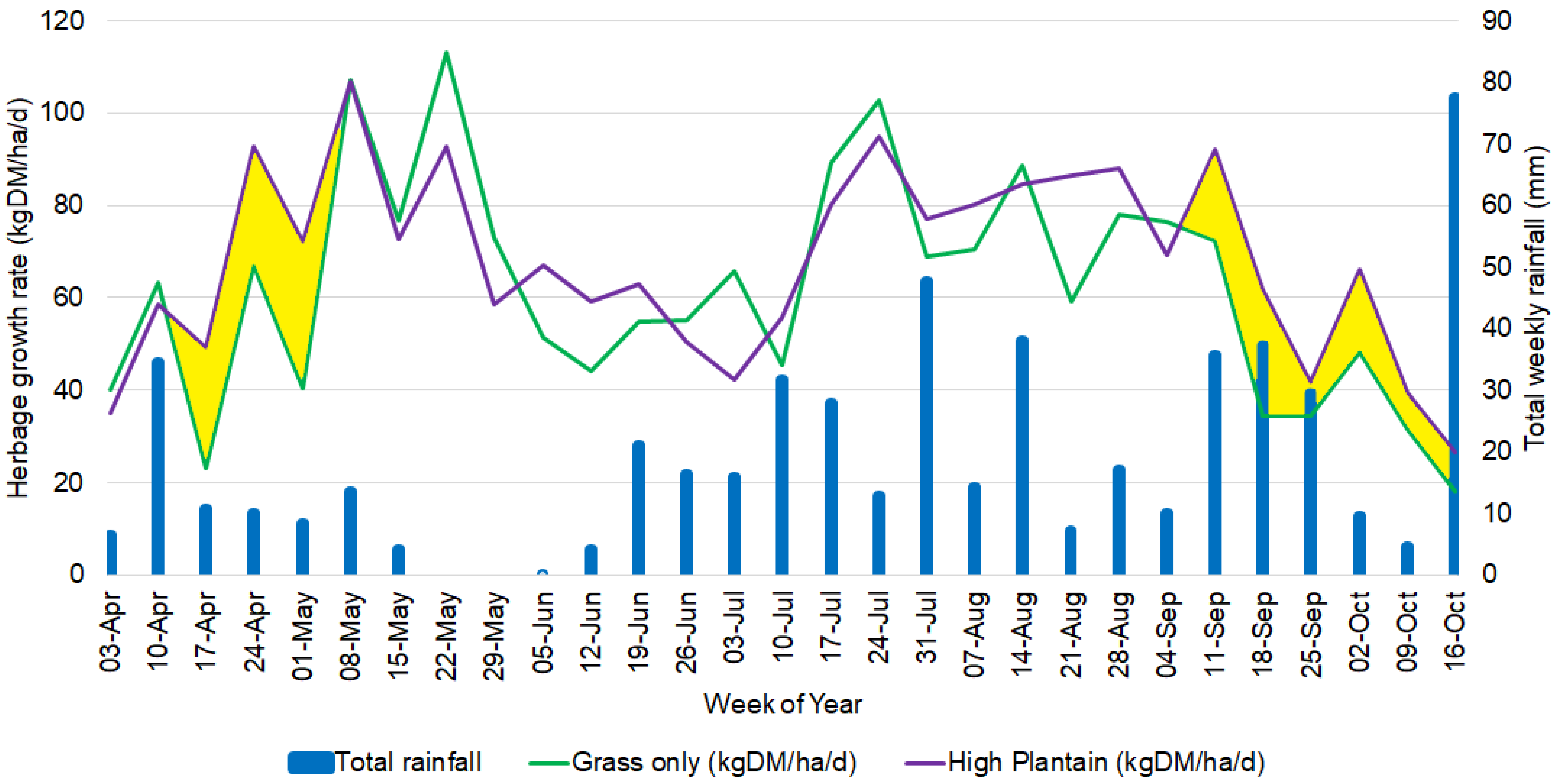
Chicory

Adding in one more species? - Plantain

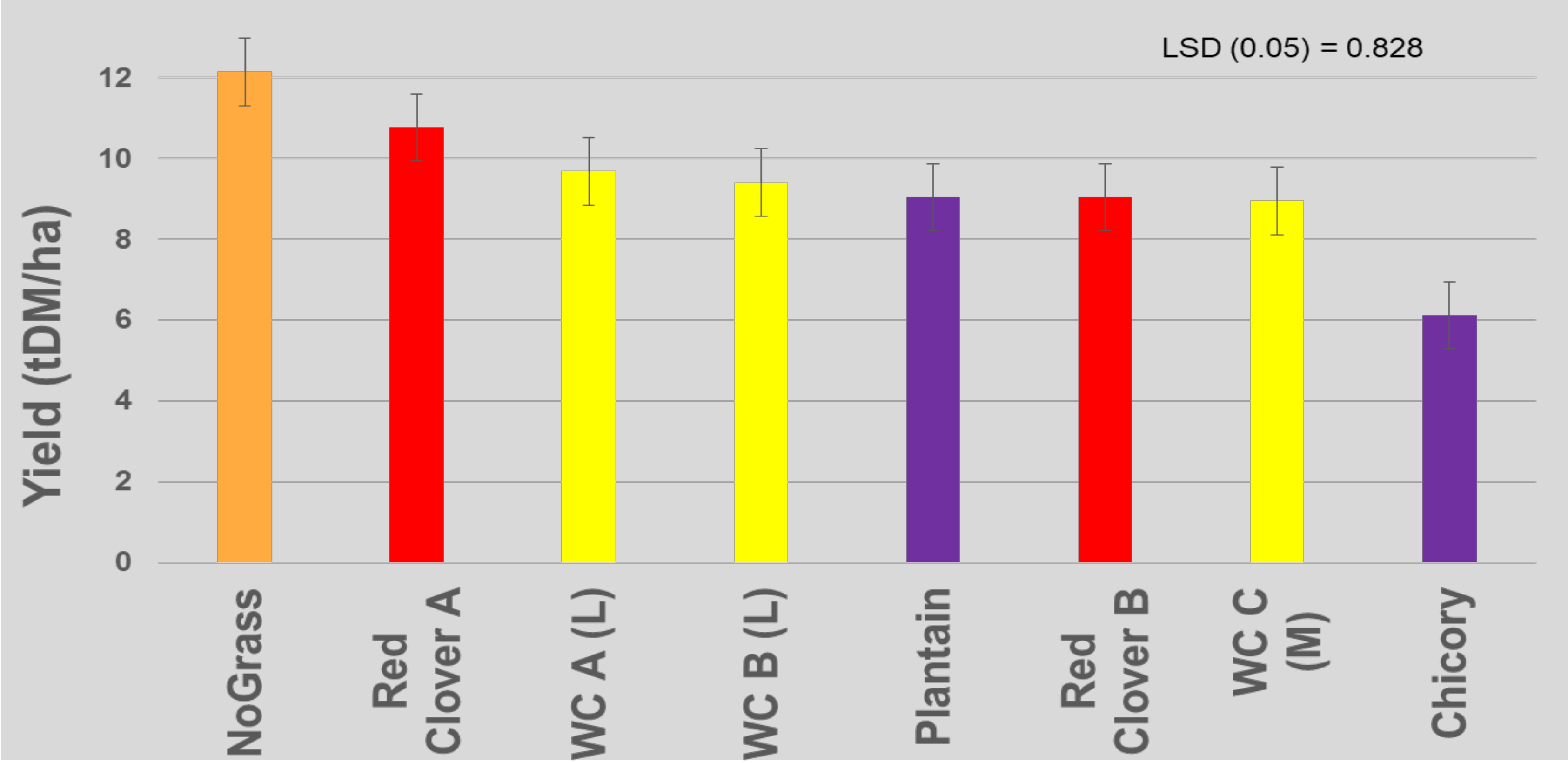
	Grass	Low Plantain	High Plantain	SED	P value
Annual Paddock Yield (kgDM/ha)	13,105 [a]	12,878 [a]	14,160 [b]	245.5	<0.001



Grass/plantain sward growth 2023



Over-yielding of novel species



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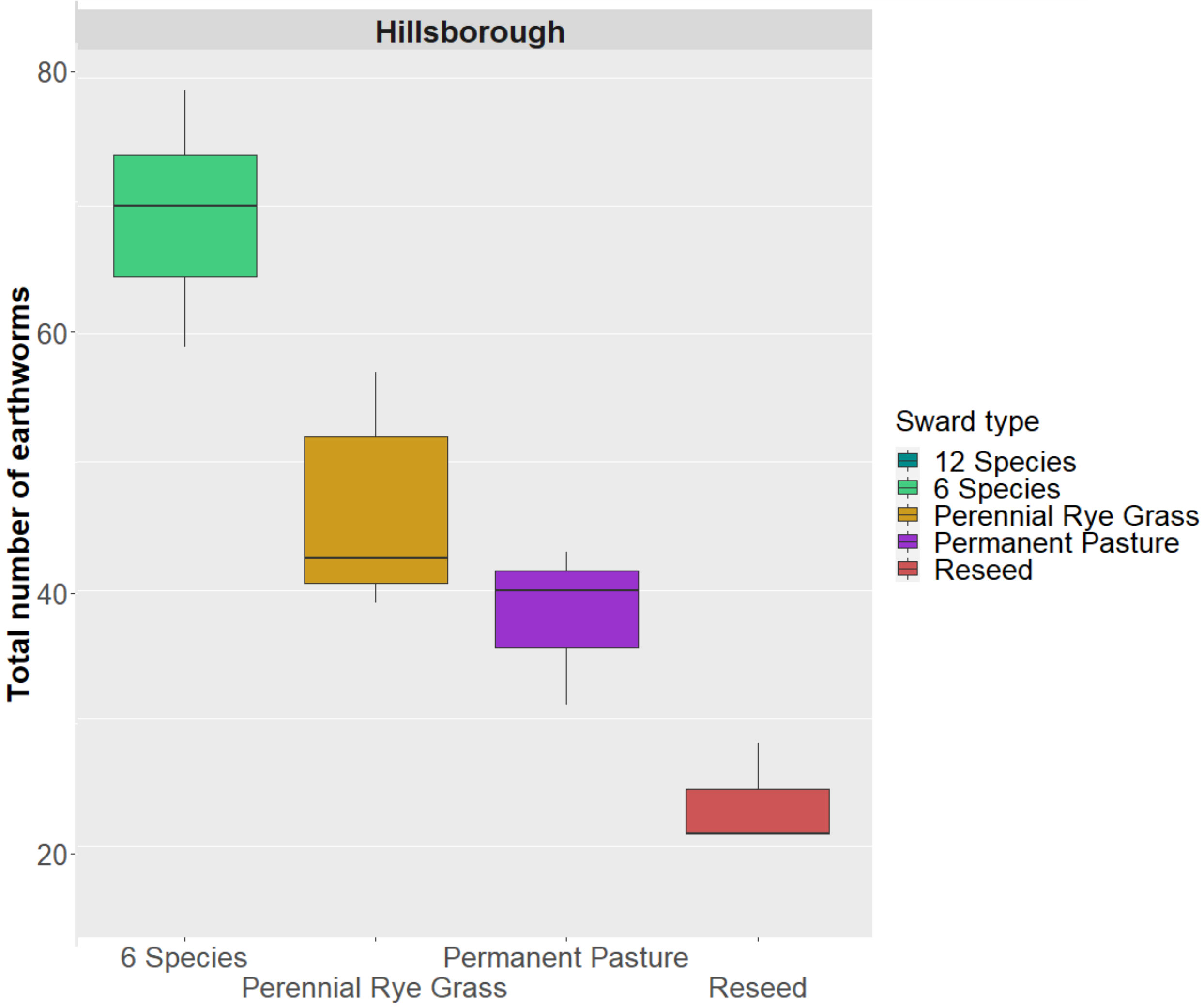
Earthworm populations

Multi-species sward

PRG pasture



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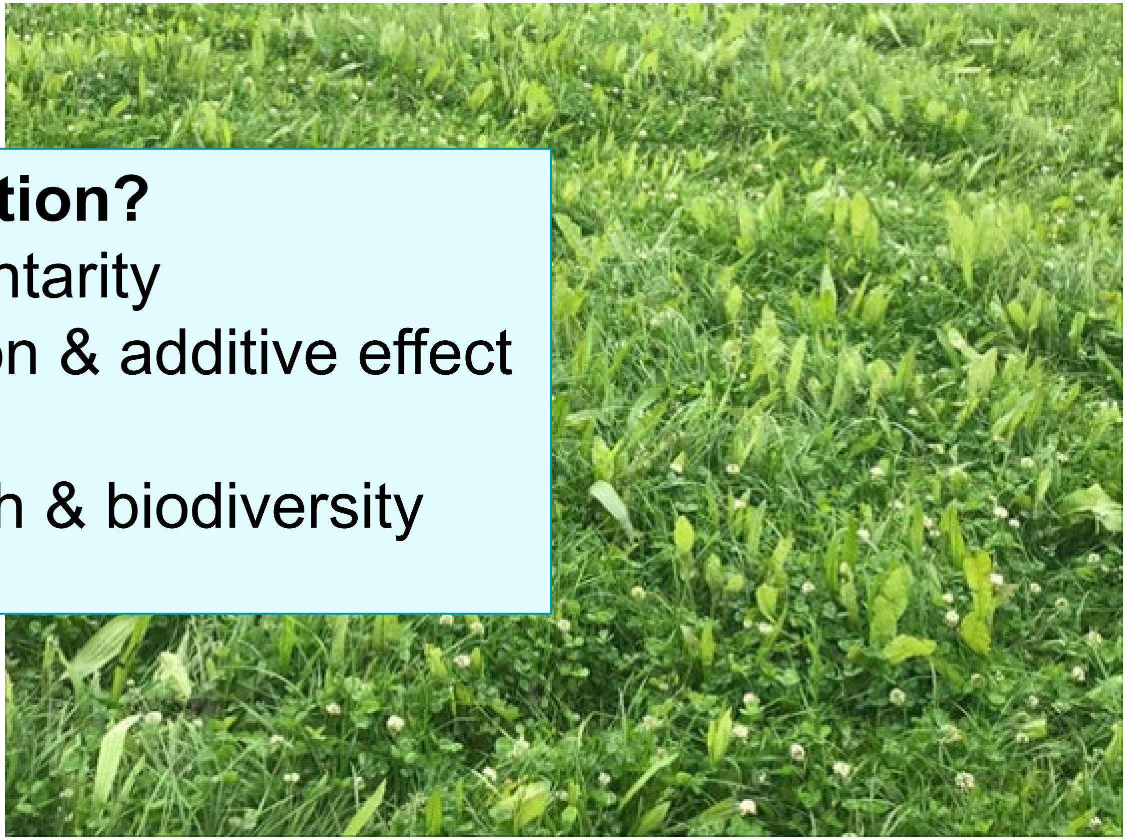
Adaptation through species diversity



Adaptation?

- species complementarity
- spread of production & additive effect
- drought tolerance
- improved soil health & biodiversity

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Sward adaptation options

1: Re-evaluate grasses?

2: Other species: legumes, herbs, others?

3: Integration with woodland?

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Adaptation by integration with woodland

Open grassland & perimeter trees

Silvopasture
(400 stems/ha planted; 130/ha 20yrs)

Woodland
(2500 stems/ha planted; 700/ha 20 yrs)

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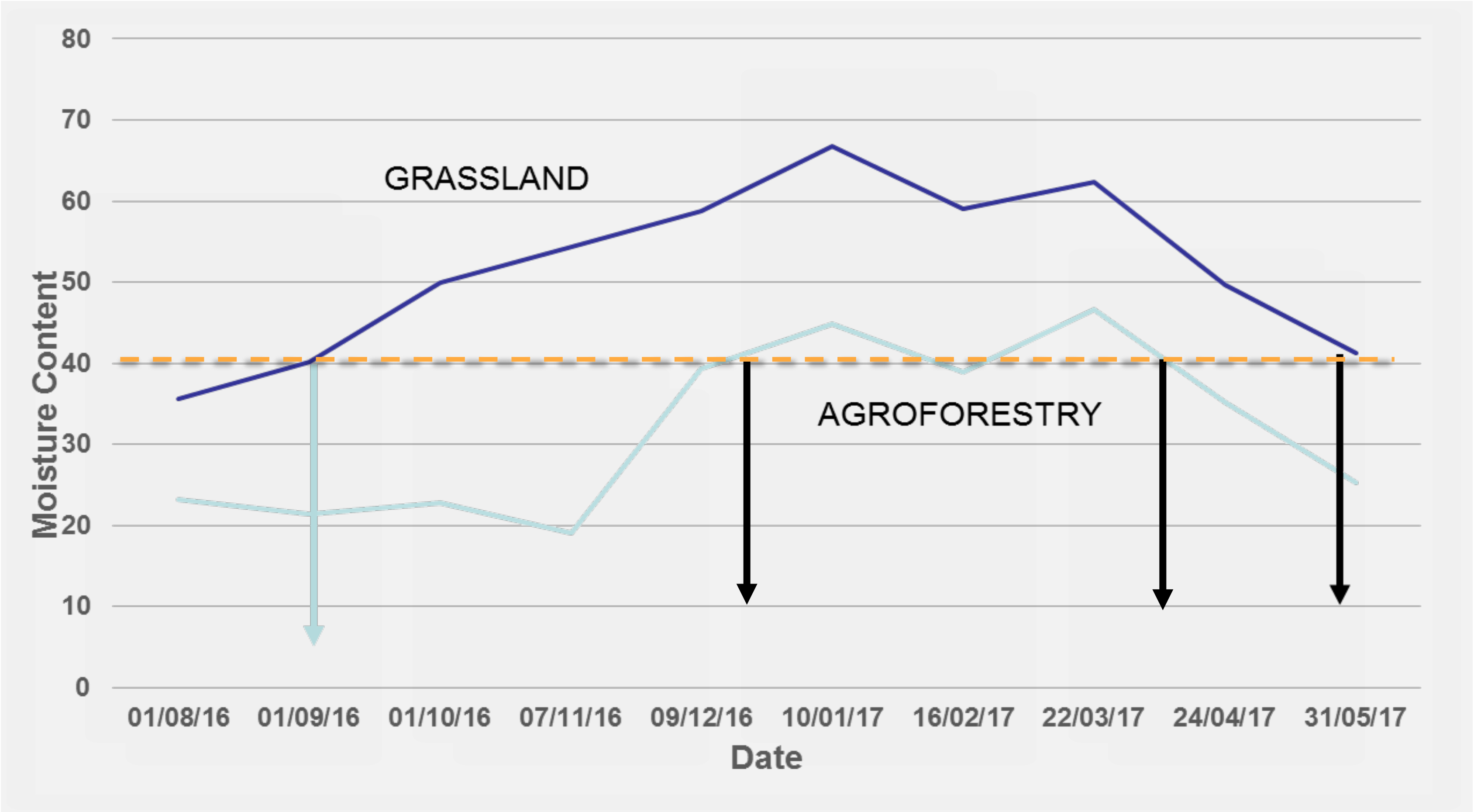
Extended grazing – enhanced field trafficability

If assume 40% soil moisture content as a cut off:
extra12 weeks in autumn & 5 in spring

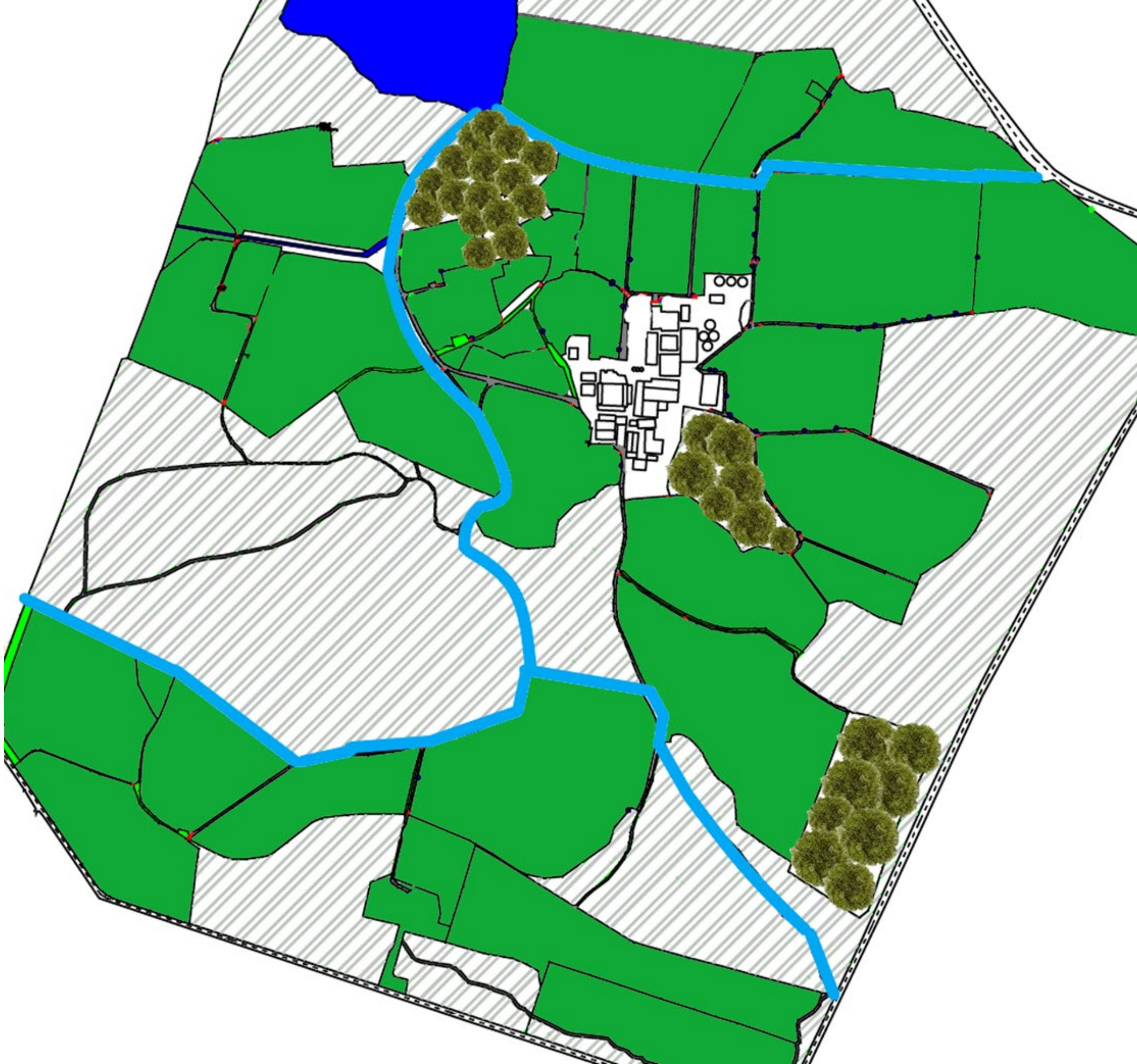


- Increased trafficability
- extended grazing season under agroforestry

- increased resilience to flash flooding
- improved biological soil health

Future Farm Resilience

Challenge:
Can we match climate adaptations to fields within typical NI farms?
i.e. tailored sward solutions



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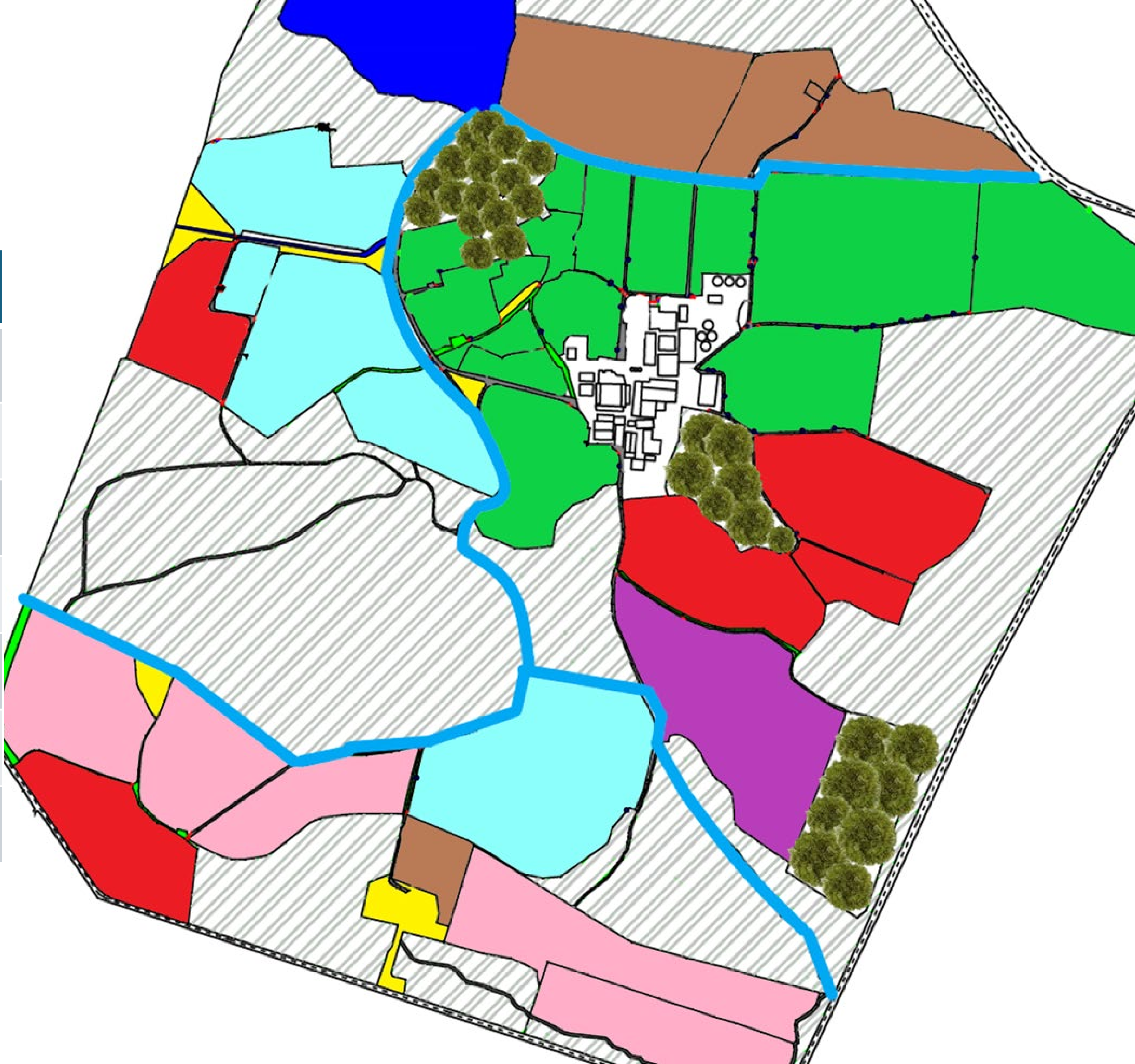
	Land Type/Field use
	Core grazing/near yard
	Outlying fields
	Wet/heavy fields
	Dry/drought prone fields
	Beside existing tree planting
	Steep slopes/near water ways
	Unproductive areas



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Core grazing/near yard

Carrying Capacity &
Early & late season growth

Silage/outlying fields

Forage legume/grass
for silage crops

Wet / heavy fields

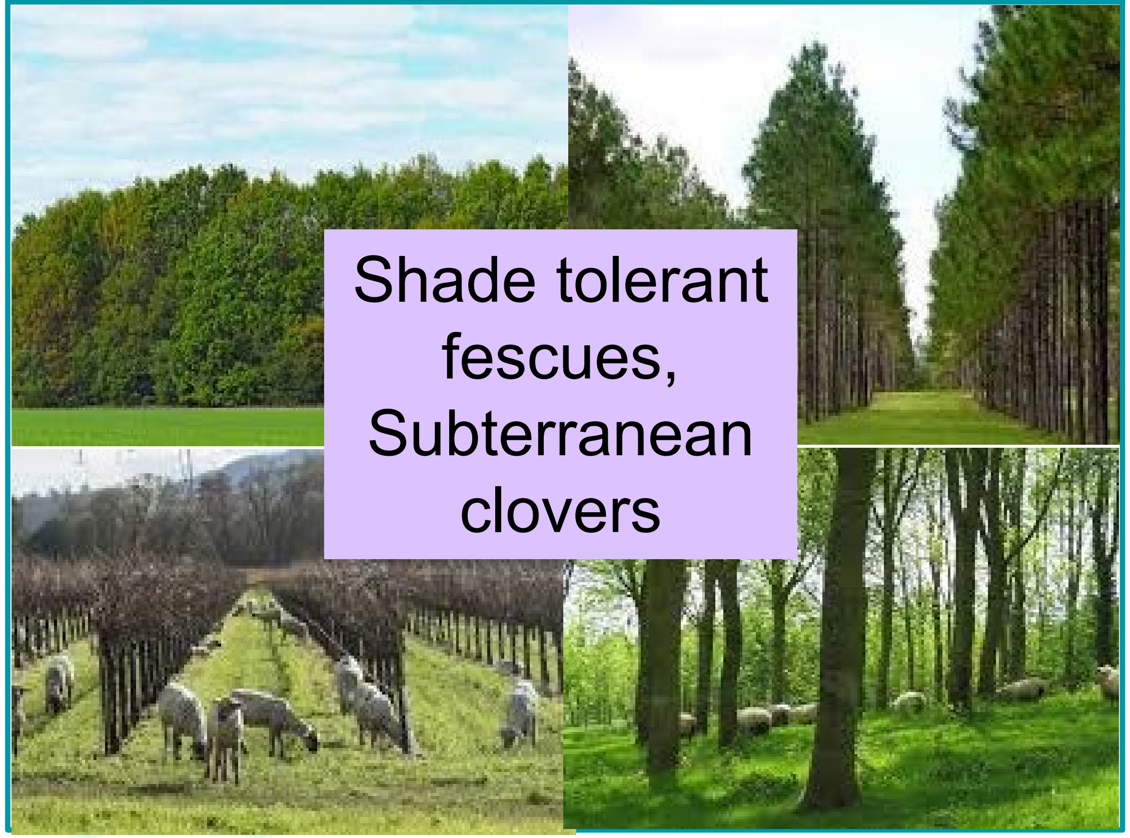
Deep rooting &
low pH & waterlogging tolerant

Dry/drought prone fields

Deep rooting & heat tolerant

Beside existing tree planting

Silvopasture



Steep slopes/near water ways

Riparian grazeable trees in run off risk areas

Less productive areas

Biodiversity

Native
woodland
Wildflowers
Wetland spp

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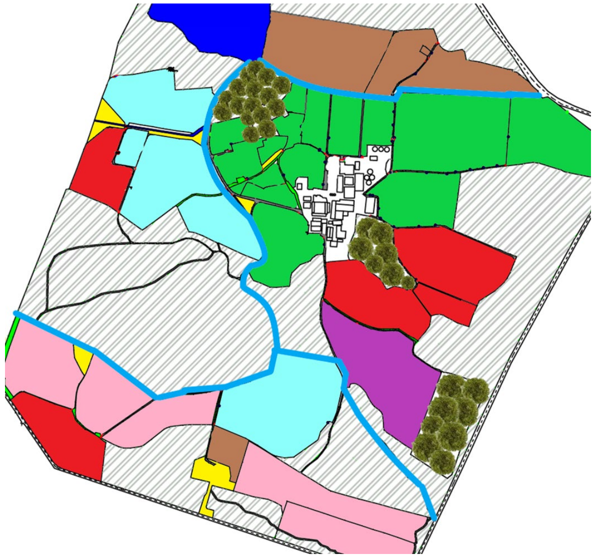
Climate adapted grassland systems

Future-proofing farms:

- agile grassland management systems
- develop grassland adaptations
- tailored sward solutions on farm



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GrassCheck 25th Anniversary Conference

Growing and utilising grass under challenging conditions

Dr. Brendan Horan

Animal & Grassland Research and Innovation Centre

Teagasc, Moorepark, Fermoy, Co Cork.

brendan.horan@teagasc.ie

web: www.teagasc.ie/dairy

@bhoran78

Presentation Overview

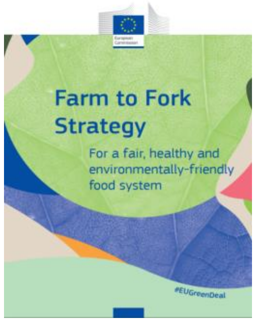
- Irish dairy in 2024 – global & local contexts
- Increasing economic and environmental importance of grazing systems
- Ongoing research projects to build the resilience of Irish grazing systems
    - Incorporating clover within the BMW dairy system
    - Multimilk- impacts of increased sward species diversity on grazing system performance
- Preliminary indications and conclusions

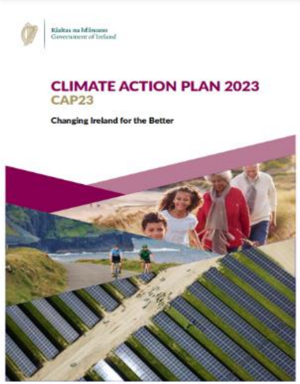
May you live in interesting times…dairy systems in 2024

- Global dairy trends:
  - Significantly increased farm gate costs, reduced margins, additional regulation
  - Increasingly challenging weather events & patterns
  - Increased competition for resources

- A Celtic Tiger of a different kind..Irish dairy 2017-2024: +33% product value & +20% milk output
  - Accelerated adoption of climate-smart practices (N use reduction, sexed semen, etc.)
  - Increased production intensity: milking platform SR, supplement and pasture use

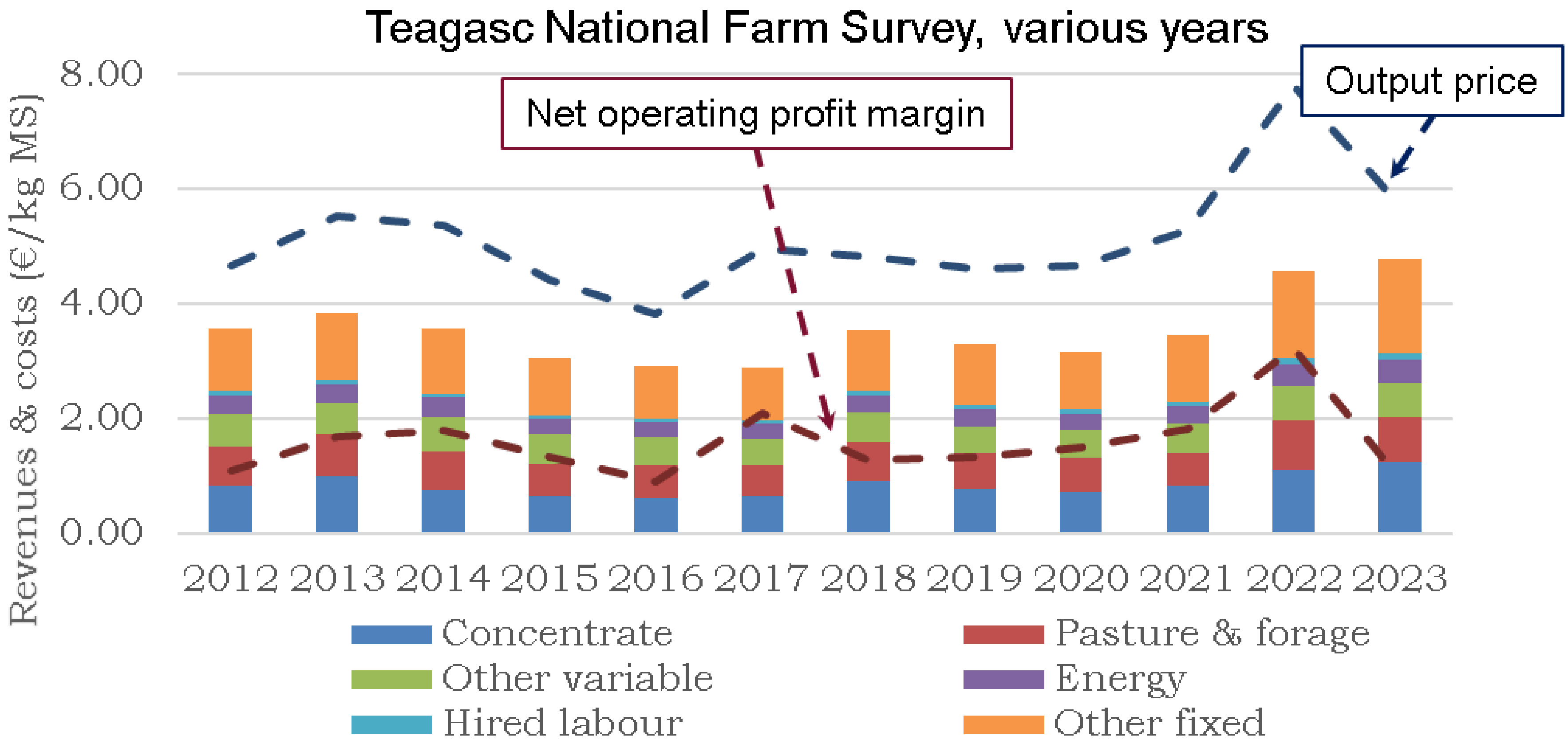
- Increasing regulatory requirements
  - Water Framework Directive (WFD; EC 2000) – all waterbodies @ good status by 2027
  - Nitrates Directive (91/676/EEC) - reinforced measures to reduce and prevent nitrate loss
  - Climate Action and Low Carbon Development Act 2020
    - Reduce agricultural GHG emissions by 25% by 2030
    - Reduce chemical N use by 25% by 2030 (<300,000 tonnes N)
    - Target 80-90% protected urea on grassland by 2025
    - All slurry by low emissions methods (trailing shoe, dribble bar)





Dairy farm economics: increased costs and reduced margins

- **Operating costs have increased by 56% during the last 5 years**

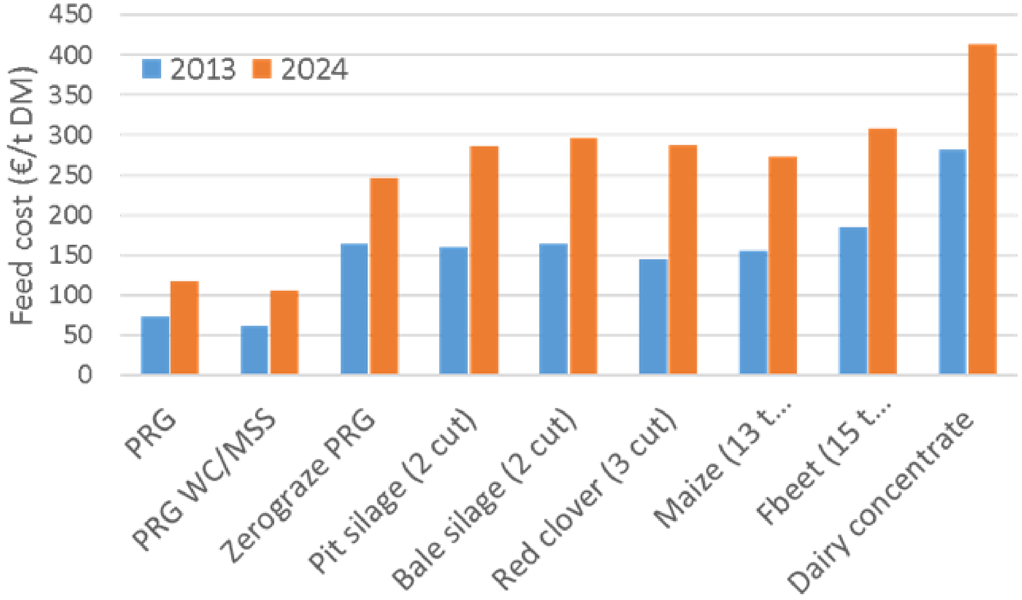


Increasing economic importance of grazed pasture

54% increase in feed costs since 2021 - alternatives to grazed pasture increasingly unaffordable

Actual feed costs (€/tonne) during 2013 and 2024. [Adapted from Finneran et al. 2011, Doyle et al., 2024]

€ Feed and fertiliser accounted for >40% of costs on Irish farms (2023)

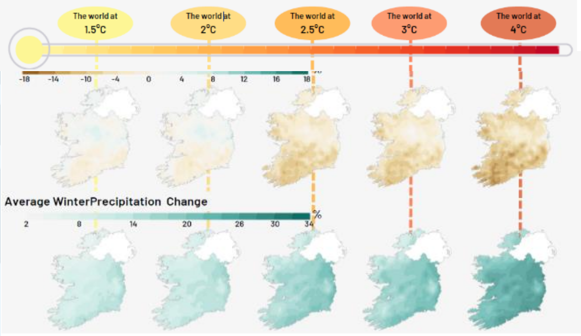


- Each additional €1 spend on feed increases total costs by €1.50 – €2.50

Climate change…adaptation & mitigation

- Despite our benign climate, hazards of extreme weather are substantial
  - +7% wetter and + 0.7° C warmer comparing 1961-1990 vs 1991-2020 (Met Éireann, 2024)
  - February 2020: wettest month in >50 years: 252% of normal rainfall (Met Éireann, 2020)
  - 2020 - 5th wettest year in UK since 1862 (UK Climate Report, 2020)
  - Climate change attribution - October 2023 - March 2024 – now x4 more likely
  - Climate models project increased frequency & magnitude of extremes - flooding/ waterlogging, soil moisture deficits

Temperature Warming Stripes (1901-2023)



Context for grazing: Diversity building system resilience

- **5 challenges to futureproof grazing systems meeting both economic, environmental and social requirements**
  - Improve pasture productivity and contribution
  - Reduce inputs – fertiliser & feed, herbicides, etc.
  - Reduce impacts – nutrient losses, GHG & Ammonia
  - Increase biodiversity & ecosystem services (C storage)

Well implemented pasture-based production systems have many advantages and can deliver required outcomes

A growing evidence base for increased pasture diversity …

- Increased climate tolerant yield stability (Nyfeler et al., 2009; Finn et al., 2018)
- Increased intake & performance (RocaFernandez et al., 2016; McCarthy et al., 2020)
- Reduced N requirement (Dineen et al., 2018; Murray et al., 2024)
- Improved milk character (Pouteraud et al., 2018)
- Reduced N leaching, NH_4 & N_20 emissions (Naverette et al., 2016; Pijlman et al., 2020
- Improved C sequestration (Fornara and Tillman, 2008, Buzhdygan et al. 2020)
- Improved rumen digestion +/- reduced risk of bloat (Pembleton et al., 2016)

Transitioning to Low N Dairy Systems in the BMW Region

Helena Walsh, Brendan Horan, Donal Patton, Luc Delaby (INRAe) and Karina Pierce (UCD)

INRAE

Teagasc
Agriculture and Food Development Authority

UCD Dublin

Experimental context

- Requirement to reduce chemical N on grassland farms (250 ›› 212 kg N/ha)
- High productivity pastures critical - >80% of feed required
- Limited adoption of white clover (WC) on farms in BMW region

Whole farm systems trial (2021-2025)

- Spring calving herd
- WF SR of 2.5 cows/ha
- MP SR 2.7 cows/ha
- 81% optimum soil fertility

% area sward renewal

	PR-new	WC-new	WC-over
2021	30	30	20
2022	50	50	40
2023	80	80	20

PRG

PRG + WC

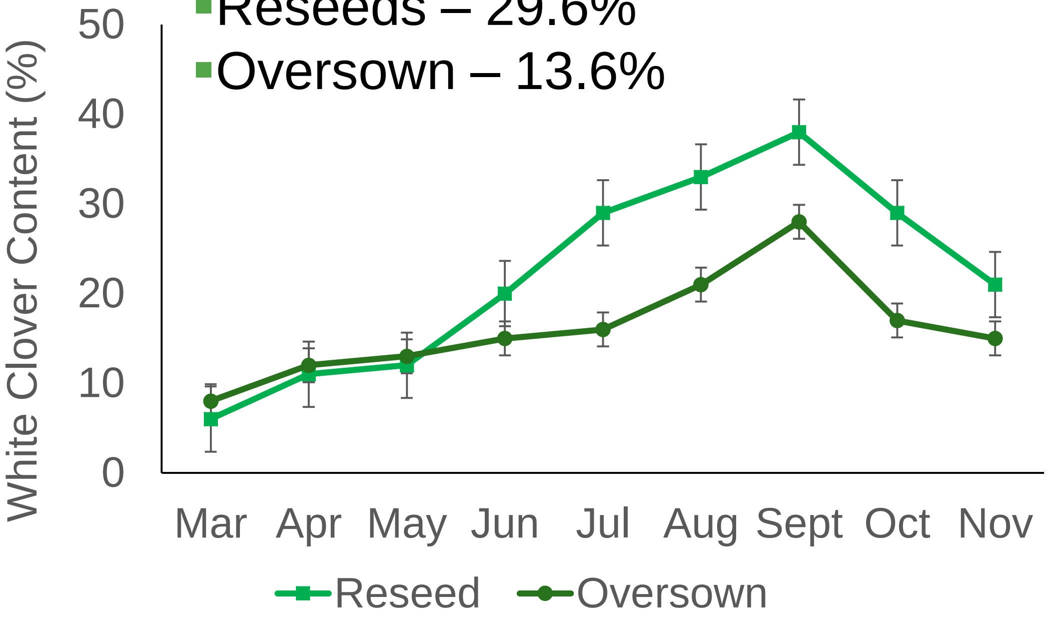
Chemical N applied

225 kg N/ha

125 kg N/ha

Successful establishment during transition

- High clover content successfully established (>20%; >1 t DM stolon/ha)
- Method of establishment had significant effect
  - Reseeds – 29.6%
  - Oversown – 13.6%



Inclusion of WC increased pasture and animal performance

- Significant reduction in chemical N applied and increased pasture production

Pasture performance & Chemical N applications				
	PR-old	PR-new	WC-new	WC-over
Pasture production (t DM/ha)				
Establishment year	14.2	8.9	8.6	11.3
Year 2		14.1	14.7	12.8
Year 3		14.9	15.6	15.2
Chemical N (kg N/ha)				
Establishment year	229	200	84	124
Year 2		245	94	103
Year 3		246	93	131

- Modest improvement in animal performance during initial transition

Farm system performance 2021-2023		
Sward system	PR	PRWC
Milk yield (litres/cow)	5,092	5,197
Fat plus protein yield (kg/cow)	461	473

University College Dublin
Ireland's Global University

MultiMilk: Evaluation of Low N Dairy Systems 2021-2025

Brendan Horan, Alann Jezequel, Caroline O'Sullivan (AGRIC), John Tobin (MFRC),
John Finn, Karl Richards, David Wall & Owen Fenton (CELUP), Cathal Buckley (RERC),
Zoe McKay (UCD), Tom O Callaghan & Alan Kelly (UCC),
uc Delaby and Anne Boudon (INRAe, France)

Dairy Research Ireland
funded by Irish Dairy Farmers

INRAE

UCD DUBLIN

SmartCow
an integrated infrastructure for increased research capability and innovation in the European cattle sector

Teagasc
Agriculture and Food Development Authority

The Irish Agriculture and Food Development Auth

Experimental Design

PRG
250 kg N/ha

PRG+WC
125 kg N/ha

Multispecies (8)
125 kg N/ha

SWARDS SOWN (kg/ha)

Species	PRG	PRG + WC	MSS
PRG	35	26.3	11
Timothy			2
Meadow fescue			4
White clover		3.8	3
Red clover			0.6
Alsike clover			3
Chicory			0.4
Plantain			1

Grazing management rules

- **Similar for all sward types**

Rotation length: 21-23 days

Post-grazing sward height: 4 cm

Stocking rate: 2.5 LU/ha

Fertiliser N:

PRG 250N: 30 kg N after each grazing

PRGWC 125N and MSS 125N: 100 kg N/ha in spring + 25 kg N/ha in September

Increasing sward diversity: pasture productivity & contents

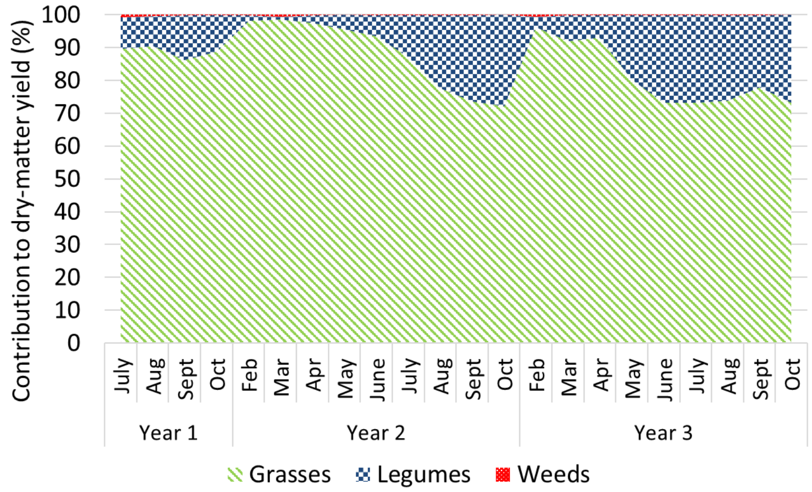
(Jezequel et al., 2024, Grass and Forage Science, In press)

The effect of sward type (ST) and year (Y) on annual total yield, grazed yield, silage yield as a three year average (2021-2023)

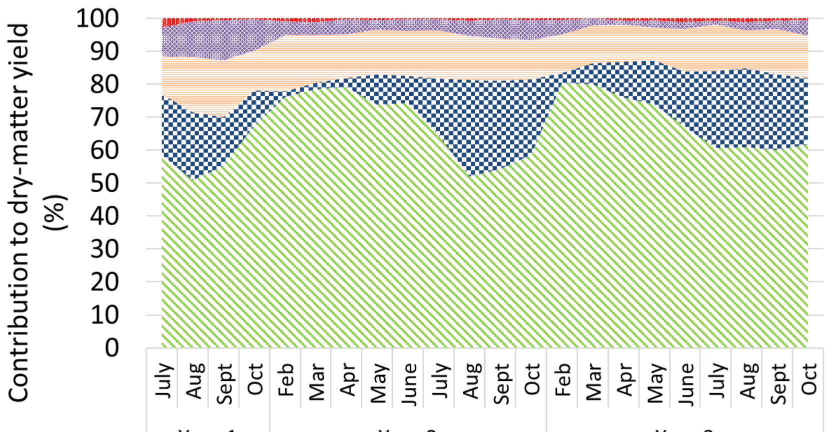
Sward type	PRG 250N	PRGWC 125N	MSS 125N	SEM	Sign[1]
Total yield (kg DM ha^{-1})	13,317	12,502	13,227	315.7	+
Grazed yield (kg DM ha^{-1})	9,104	9,031	9,429	462.9	N.S.
Conserved yield (kg DM ha^{-1})	4,214	3,472	3,799	473.4	N.S.

PRGWC & MSS: similar nutritive value with lower chemical N application

PRGWC 125N



MSS 125N

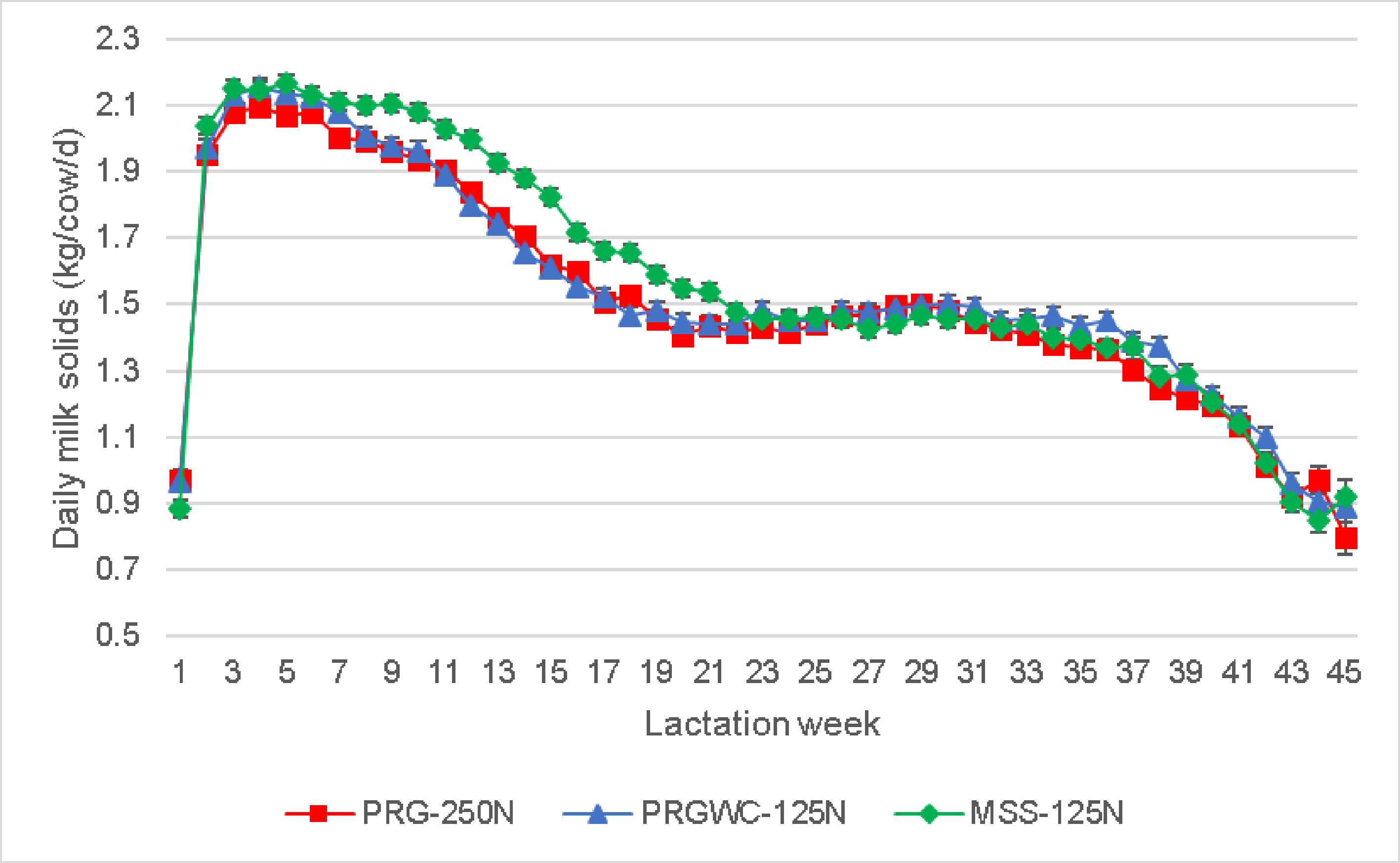


Increasing sward diversity increased animal intake & performance

(Jezequel et al., 2024, JDS)

	P-value
DM inta	
Pasture	<0.001
Total	<0.001

	P-value
Milk yiel	0.001
Fat %	0.05
Protein (	N.S.
Fat plus	0.001



Preliminary indications & conclusions…

- Positive future for resilient diversified grazing systems
- Embrace the challenges – improved productivity from pasture, reduced N fertiliser use, reduced emissions & nutrient losses, enhanced ecosystems
- The incorporation of clovers in grazing swards is essential, saving N, improving animal performance, reducing production costs and impacts
- The incorporation of additional species (MSS; grasses, clovers, herbs) offers added potential to further enhance animal intake and performance, while delivering additional eco-system services (reduced N losses, greater climate tolerance, improved biodiversity, C storage, etc.)
- Future research must stabilise & increase WC and MSS contributions

Closing Remarks

Prof. Gerry Boyle

Chair, AgriSearch


AgriSearch NI
Driving Excellence & Innovation
25
GrassCheck NI
25th Anniversary Conference
Future-Proofing Our Pastures:
25 Years of GrassCheck and Beyond